DOCUMENT RESUME

ED 260 433 CS 209 221

TITLE	Thinking through Language. Teacher Guide.
INSTITUTION	National Council of Teachers of English, Urbana, Ill.
REPORT NO	ISBN-0-8141-5015-2
PUB DATE	85
NOTE	67p.; For Books One and Two, see CS 209 222-223.
AVAILABLE FROM	National Council of Teachers of English, 1111 Kenyon Rd., Urbana, IL 61801 (Stock No. 50152, $3.95).
PUB TYPE	Guides - Classroom Use - Guides (For Teachers) (052)
EDRS PRICE	MF01/PC03 Plus Postage.
DESCRIPTORS	Abstract Reasoning; Association (Psychology); *Cognitive Development; *Cognitive Processes; Conflict Resolution; Convergent Thinking; Creative Thinking; Critical Thinking; Decision Making; Educational Theories; High Schools; Intellectual Development; Intuition; Junior High Schools; Language Arts; *Language Processing; Logical Thinking; Perception; Perceptual Development; Problem Solving; Secondary Education; *Teaching Methods

ABSTRACT

One of three related documents produced in response to a need for direct instruction in thinking skills at the secondary level, this teaching guide for Book One and Book Two of "Thinking Through Language" is intended for junior or senior high school English teachers. The guide contains an introduction and summaries of Book One and Book Two, followed by the two main sections, each corresponding to one of the books. Both sections begin with an outline or instructional overview, which lists the cognitive fields, objectives, and typical activities involved for each unit. The first section contains instructional information about the four units in Book One: experiencing the arts, exploring possibilities, investigating the issues, and probing the future. The second section contains instructional information about the four units in Book Two: perception, relationships and connections, problem solving, and the creative imagination. Teacher resources and bibliographies are included. (EL)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED260433

chard. My apple trees will never get across And eat the cones under his pines, I tell him. He only says, "Good fences make good

it so unnerved me in the contemplation of the House of Usher? It was a mystery all insoluble; nor could I grapple with th

ints and free throw, but Lee Madison rebounded and laid it in for a 68-64 lead. A basket by Alvarez closed the scoring. Houstor

57 REM ** THE RAW DATA ON GAS USAGE IS GIVEN. 1440 PRINT D;A[D,J],B[D,J],U[D,J],G[D ** TH

the Soviet ambassador sped toward West Germany, "the Russians acted immediately. Moscow was alerted and, within seconds, on a

A classically styled hooded jacket in a cotton polyester blend that is wind resistant and water repellent. Features include flapped pockets, ragl

U.S. DEPARTMENT OF EDUCATION
NATIONAL INSTITUTE OF EDUCATION
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

X This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official NIE position or policy.

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

NCTE

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

Thinking through Language

Teacher Guide

2

CS209221

THIS BOOK IS THE PROPERTY OF:

STATE _____
PROVINCE _____
COUNTY _____
PARISH _____
SCHOOL DISTRICT _____
OTHER _____

Book No. _____
Enter information in spaces to the left as instructed

ISSUED TO	Year Used	CONDITION	
		ISSUED	RETURNED

PUPILS to whom this textbook is issued must not write on any page or mark any part of it in any way, consumable textbooks excepted.

1. Teachers should see that the pupil's name is clearly written in ink in the spaces above in every book issued.
2. The following terms should be used in recording the condition of the book: New; Good; Fair; Poor; Bad.

BEST COPY AVAILABLE

NCTE

National Council of Teachers of English
1111 Kenyon Road, Urbana, Illinois 61801

Thinking through Language

Teacher Guide

5

NCTE Advisory Committee on Publications for Students: John H. Bushman, Chair; Ouida H. Clapp; Beverly Haley; Joan Hansen; Hugh D. Rank; Shirley Wurth; Theodore Hipple, *ex officio*; Paul O'Dea, NCTE Staff Liaison.

Book Design: Allen Carr Design

NCTE Stock Number 50152

© 1985 by the National Council of Teachers of English. All rights reserved. Printed in the United States of America.

It is the policy of NCTE in its journals and other publications to provide a forum for the open discussion of ideas concerning the content and the teaching of English and the language arts. Publicity accorded to any particular point of view does not imply endorsement by the Executive Committee, the Board of Directors, or the membership at large, except in announcements of policy, where such endorsement is clearly specified.

Contents

Preface vii

Introduction ix

Book One

Instructional Overview 3
A Note to the Teacher 4
Teaching Suggestions 8
Teaching the Units 10
Bibliography 32

Book Two

Instructional Overview 35
A Note to the Teacher 36
Teaching the Units 37
Bibliography 57

Preface

As part of its central mission to improve the teaching of English, NCTE, in the spring of 1983, asked readers of the *English Journal* to complete and return a survey that asked them, generally, what needs they had and how the Council might improve its services to them. Among the questions was one that asked which kinds of instructional materials were needed and yet not widely available from commercial publishers. The response was a clear first preference for instructional materials on thinking skills.

Although the Council has traditionally published only professional books, in the spring of 1983 the NCTE Executive Committee established the Advisory Committee on Publications for Students. The charge to the Committee was "to identify which instructional materials for students are most needed and not provided by commercial publishers; to identify authors to write such instructional materials; and to evaluate the consequent manuscripts submitted for NCTE publication." The materials for the first program having been clearly identified, the Committee met in the summer of 1983 to find authors. A dozen authors or teams of authors with established reputations as creators of instructional materials were identified and invited to submit proposals. From these the Committee chose Dan Kirby and Carol Kuykendall to write a book for junior high and middle school students, and Barbara and Gene Stanford to create a book for senior high school students. Not incidentally, the four authors have been leaders in the Council, writing or editing NCTE books and contributing as departmental editors of the *English Journal*.

Manuscripts were submitted by the fall of 1984 and then evaluated by Committee members, who had been selected for *their* experience in publication of textbooks and other instructional materials. The quality of the *Thinking through Language* books, we think, is extraordinary. One reason is surely that the authors were not compelled to make the kind of compromises commercial publishers find necessary for a basal textbook to appeal to a mass market. But the more important reason for the high quality of the materials is the ability of the authors to prepare simple lessons toward the comprehension of complex content—an ability impossible without the authors' intimate knowledge of secondary school students and the secondary school classroom.

Here, then, is *Thinking through Language*—the title is deliberately ambiguous—in two complementary instructional books. In the pages that follow, the authors explain the premises and theories that led them not only to the content of the program but to its bold instructional approach.

For many years, we English teachers have worked toward the goals of more lucid writing, a deeper understanding of literature, and a more efficient use of language. It is time to recognize that all of these goals proceed from one source—sound thinking—and that this thinking does not occur in isolation, but occurs as humans reach their potential in the efficient use of their language.

The Committee hopes that this instructional program fills a need in your curriculum.

John H. Bushman, Chair
NCTE Advisory Committee on
Publications for Students

Introduction

In 1982, the Education Commission of the States, referring particularly to the 1979–80 report of the National Assessment of Educational Progress on the ability of seventeen-year-olds in reading and literature, decided that a return to "the basics" was in order. However, the Commission cautioned, the true "basics" of today and tomorrow would concentrate on thinking skills, such as the ability to analyze and synthesize, to infer accurately, to have in mind problem-solving strategies, to evaluate, to predict, and to be able to communicate effectively through a variety of modes. Particular emphasis was placed on students' ability to read and write beyond superficial response.

Not surprisingly, then, the development of students' thinking skills will more likely fall to the responsibility of teachers of English than to the teachers of any other subject. ***Thinking through Language*** is a response to a need for direct instruction in thinking skills.

The program is presented in two books. Book One, written by Dan Kirby and Carol Kuykendall, bases its approach on the involvement of students in direct experiences. Role-playing, for example, is a typical mode of instruction. This kind of instruction works particularly well with junior high and middle school students but is also appropriate at the senior high level. Book Two, written by Barbara and Gene Stanford, bases its instruction on the development of skills within the context of solving real problems.

If the entire program is adopted by a high school, Books One and Two should be used in sequence. However, the four units in each book should be taught in order but preferably not within the same block of time. (Sequence is explained further by the authors later in this guide.) More important, the content of the program, quite apart from the breadth of the subject matter of thinking, is designed for integration into the high school curriculum. Just where and how it can be integrated depends on the particular circumstances of each school, but even more on the discretion of teachers, as does so much else in this unconventional program.

Whatever their different emphases, the authors of ***Thinking through Language*** do not pretend that thinking skills are new to the adolescent student nor, worse, that these skills can be taught in isolation or by drill. Working sometimes through language and sometimes through literature, students are always engaged in experience-based tasks involving real communication among themselves and with the teacher. In recognition of the humanistic tradition that has always guided the best English teaching, the learning activities recognize the value of intuition as well as the virtues of the scientific method. Similarly, if one concedes that computers are more efficient than humans in sorting and storing information, then primacy should be placed on our need for synthesizing and interpreting information and extrapolating from it.

In later sections of this guide, the theory and operation of the program are explained in detail by the two teams of authors. What follows are their respective general comments about the program.

Book One

by Dan Kirby and Carol Kuykendall

The intent of Book One is to integrate rather than to isolate—not only the thinking skills but the language arts themselves. Such an approach is rooted in the assumption that talking and writing are means of thinking, as are listening and reading. By dealing with language and thought organically, the instructional program seeks to nourish both.

This holistic approach is a reflection of our beliefs about higher-order thinking. We are committed to what John Anderson (1983) calls the "unity of human cognition." We share his belief that all "higher cognitive processes, i.e., memory, language, problem solving, imagery, deduction, and induction, are different manifestations of the same underlying system."

We believe that language is more than an element in this unitary system—indeed, that it imbues all higher cognitive processes. We agree with James Moffett (1983) that modification of inner speech is central to cognitive growth—that is, to changing and extending what the mind can do. Reading and writing provide powerful ways of modifying inner speech. These language experiences stimulate, focus, integrate, and revise the stream of thoughts, feelings, and images that run nonstop through every person. To become better thinkers, students must learn to listen to their own inner voices, to trust their own intuitions, and to make their own meaning from each experience.

As teachers and practitioners of the language arts, we recognize the complexity of designing instructional materials that fully implement this philosophy. Still, this must be our goal. The materials seek to engage particular operations of the mind. However, the lessons are clearly experience-based. Critical, analytic, synthetic, interpretive, and creative thinking are thus embedded in a web of direct experiences. These experiences are designed to help students—both individually and collaboratively—to put things together, to make connections, and to compose wholes. The cognitive model used is borrowed from Albert Upton, who defined thinking as the art of *making* sense and who saw language as a primary means of doing so.

For reasons suggested by Edward de Bono (in Bassone 1983), the text of Book One focuses on perception:

> Most thinking takes place in the perception stage. Only very rarely and in very special circumstances is complex logical progression or mathematical processing required. As computers come to take over more and more of our second-stage thinking, the burden will fall even more heavily on the first stage, perception. Perception covers how we see the world at the moment. We see it, of course, in terms of the experience maps we have built up in the past. So perception involves finding the right "maps" and reading them.

The lessons in Book One help students develop richer experience maps through activities ranging from drawing and dramatization to simulations and team problem solving. The rationale for such concrete-level activities finds further support in the increasing body of evidence that surprisingly few high school students have grown fully into what Piaget terms the stage of formal operations. Since students are so strikingly divergent in both stages of growth and styles of learning, the lessons in the text offer abundant options. In fact, each lesson features choices within choices. After choosing among alternative tasks, students select their own ways of approaching those tasks. By reflecting on these approaches and comparing them to those of their classmates, students then discover how their own minds work.

The lessons in the text never encourage a rush to "right" answers or prescribed products. The emphasis remains firmly on *process,* on helping individual students discover and extend the intellectual operations that work best for them. Book One is thus a guide for the student's own journey through words and ideas.

Book Two

by Barbara Dodds Stanford and Gene Stanford

Book Two is designed to build on the thinking skills that the student already possesses and, ideally, on the experiences he or she has been through in Book One. It provides training in the analytical skills that have been emphasized during the past two centuries, but also provides systematic development of the intuitive skills that seem to be more needed in the present global, nuclear, computerized age.

For pedagogical purposes, the processes of thinking have been broken down into isolated steps, skills, and modes of thinking. In reality, the thinking processes are not easily divisible into separate categories, as can be seen by even a cursory glance at the research on thinking processes. There is not as yet much agreement among researchers on labels and definitions of thinking skills. The categories and labels used in this program, therefore, are not intended as a definitive analysis of thinking skills, but rather as a convenience for teaching.

The skills taught in Book Two may be divided into three main categories: intuitive, rational, and integrative. Intuitive skills are similar to those in Jean Piaget's sensorimotor and preoperational categories (1950) and those that Robert Samples (1974) labels "preconscious thought." These skills also contain elements that Benjamin Bloom (1956) includes under the affective and sensorimotor domains. Intuitive skills include the kind of investigative, seeking, grasping, and trial-and-error thinking that is associated by Ellis Torrance (1974) with creative thinking and by Janet Emig (1971) with the prewriting process.

The second major range of skills in Book Two is in the area of rational-analytic skills. These make up the bulk of Bloom's cognitive domain and include the concrete operations and most of the formal operations in Piaget's categories. They are the skills identified by R. E. Ornstein (1972) with the left brain.

The third level of skills—the integrative—seem to require the interaction of intuitive and analytical skills. They are of the sort that Abraham Maslow (1968) described as self-actualizing creativity. This category includes synthesis and evaluation in Bloom's cognitive domain and organization and characterization in his affective domain. Integrative skills also include the more advanced skills from Piaget's formal operations as well as sophisticated skills such as systems analysis, as developed by L. von Bertalanffy (1968) and Joel de Rosnay (1979), which are only now being identified.

References

Anderson, John. *The Architecture of Cognition.* Cambridge: Harvard University Press, 1983.

Bloom, Benjamin. *Taxonomy of Educational Objectives: Cognitive Domain.* 1956. Reprint. New York: Longman, 1977.

de Bono, Edward. "The Direct Teaching of Thinking as a Skill." In *The Fourth R: Reasoning,* ed. Richard M. Bassone. New York: Center for Advanced Study in Education, 1983.

de Rosnay, Joel. *The Macroscope: A New World Scientific System.* New York: Harper & Row, 1979.

Emig, Janet. *The Composing Processes of Twelfth Graders.* Urbana, Ill.: National Council of Teachers of English, 1971.

Maslow, Abraham. *Toward a Psychology of Being* 2d ed. New York: Van Nostrand Reinhold, 1968.

Moffett, James. *Coming on Center: English Education in Evolution.* Upper Montclair, N.J.: Boynton/Cook, 1981.

Ornstein, Robert E. *The Psychology of Consciousness.* San Francisco: Freeman, 1972.

Piaget, Jean. *The Psychology of Intelligence.* 1950. Reprint. Boston: Routledge & Kegan Paul, 1971.

Samples, Robert. "Kari's Handicap: The Impediment of Creativity." In *Psychology of Education: New Looks,* ed. G. Davis and T. Warren. Lexington, Mass.: D.C. Heath, 1974.

Torrance, E[llis] Paul. "Creativity and Infinity." In *Psychology of Education: New Looks*, ed. G. Davis and T. Warren. Lexington, Mass.: D.C. Heath, 1974.

Upton, Albert. *Design for Thinking: A First Book in Semantics*. Rev. ed. Palo Alto, Calif.: Pacific, 1973.

von Bertalanffy, L. *General System Theory*. New York: Braziller, 1968.

Thinking through Language

Book One

Instructional Overview

Unit I **Experiencing the Arts**

Cognitive Field: Perception
Reliance: Sensory experience
Role-playing Mode: Artist
Typical Activities: Logging experiences, creating collages, selecting, associating
Thinking Skills: Perceiving, selecting, arranging, associating, categorizing, interpreting, comparing, contrasting, reflecting

Unit II **Exploring Possibilities**

Cognitive Field: Speculation
Reliance: Imagination
Role-playing Mode: Inventor
Typical Activities: Writing scenarios, brainstorming, evaluating
Thinking Skills: Speculating, imagining, investigating, planning, sequencing, analyzing, problem finding, problem solving, evaluating, inventing, reflecting

Unit III **Investigating the Issues**

Cognitive Field: Extrapolation
Reliance: Curiosity
Role-playing Mode: Researcher
Typical Activities: Creating questions, finding sources, surveying
Thinking Skills: Questioning, analyzing, categorizing, synthesizing, interpreting, generalizing, evaluating, reflecting

Unit IV **Probing the Future**

Cognitive Field: Projection
Reliance: Imagination
Role-playing Mode: Futurist
Typical Activities: Making metaphors, forecasting, writing scenarios
Thinking Skills: Comparing, sequencing, forecasting, predicting, interpreting, imagining, planning, reflecting

A Note to the Teacher

from Dan Kirby and Carol Kuykendall

As teachers ourselves, we realize what you expect of this guide to Book One. You expect answers to some practical questions. What does *Thinking through Language* really teach? Which thinking skills? Which language skills? Must the book be taught straight through, or can the units be interspersed throughout the year? How much time will each unit take? What special materials are needed? How can work on thinking be integrated with ongoing work in literature and composition? What about classroom management?

The Teaching Suggestions beginning on page 8 offer detailed answers to such questions. Rather than skipping ahead to that section on practice, though, we hope that you'll take time for a little theory. Knowing the theory that undergirds *Thinking through Language, Book One* will help you make better decisions about how to use it with your students. Even though the student text is quite explicit about *what* to teach and the teacher guide about *how*, neither is rigid nor prescriptive. Both leave plenty of room for your on-the-spot judgments. To help you get ready, we would like to share our own theoretical perspective on thinking.

Thinking about Thinking

What *is* thinking? Is it processing information in a mental computer? Or is it creating mind pictures? Reasoning? Analyzing and synthesizing? Making critical judgments?

Probably, thinking is all of these things and more. It's really the *more* we're after. What is it that underlies all these ways of thinking? What is it that really goes on in the mind?

To us, it is the making of meaning. In fact, that is our definition of thinking. In this definition, the word *making* is meant literally. We're convinced that every mind creates its own understanding by pulling things together in its own way. In short, thinking is *making* sense.

Let's look at two quotations from theorists who express this same view in different ways.

> *Thought* in the broadest sense is the creation of worlds, both "real" and imaginary. . . . My metaphor pictures the brain as an artist, as a creator of experience for itself and for others, rather than as a dealer in information.
>
> —Frank Smith (1983)

> Forming is the mind in action. It is what we do when we learn, when we discover or recognize; when we interpret, when we come to know. Forming is how we make meaning.
>
> —Ann Berthoff (1981)

We like Frank Smith's metaphor of the brain as an artist with the capacity to create, select, and arrange experience. This metaphor fits Berthoff's view that the mind forms meaning from a chaos of images, memories, and utterances. The idea that all of us find and form meaning for ourselves isn't too far from Piaget's idea that we invent our own understanding. Smith, Berthoff, and Piaget all agree that each mind must do its own creating, forming, and inventing—indeed, must make its own meaning. To us, that's what thinking is and what *Thinking through Language* is all about.

One more point about the making of meaning: it is not a mechanical process. Creating, forming, and inventing are "not assembling parts into wholes, not filling slots and grids, not manipulating discrete elements like chessmen and Scrabble squares" (Berthoff 1981). Thinking is much more complex—which is to say, more human.

This organic view of thinking matches what Anderson (1983) calls the "unity of human cognition," the belief that "all higher cognitive processes, i.e., memory, language, problem solving, imagery, deduction, and induction, are different manifestations of the same underlying system." Psychologists are far from unanimous in accepting this view, but even those who favor a theory of "multiple intelligences" acknowledge what is

summarized best by Howard Gardner (1983): "The intelligences actually interact and build upon one another from the beginning of life. Complexes of intelligences function together smoothly, even seamlessly, in order to execute intricate human activities."

What does all this mean? We're not sure, but we understand enough to avoid dissecting the natural process of thinking into artificial subskills. In Book One of *Thinking through Language*, different activities *do* emphasize particular operations of the mind. Lessons, for example, may focus on observing, comparing, arranging, inventing, analyzing, evaluating, or predicting. Always, though, these operations work in concert, just as they do in everyday life. We try very hard to keep emphasis from becoming isolation.

Perception: One of our strongest emphases is *perception*, where, in Ulrich Neisser's words, "cognition and reality meet." One reason for this focus is that all thinking is rooted in perception (Neisser 1976). Another is suggested by Edward de Bono (in Bassone 1983): "Most thinking takes place in the perceptual stage. Only very rarely and in very special circumstances is complex logical progression or mathematical processing required. As computers come to take over more and more of our second-stage thinking, the burden will fall even more on the first stage, perception."

Thus, most of the thinking we use to do mental tasks and to make meaning involves perception. We might call such thinking *active thinking*. However, we also need to consider *reflective thinking*—the kind used to get inside the mind and discover how it works in doing different tasks.

Reflection: Reflection is a form of "metacognition," the process of thinking about thinking. It brings mental activities to a higher level of awareness so that they can be examined, connected, and consciously applied. Reflective thinking develops what Sternberg calls "the executive processes," those that manage and monitor the processes doing the actual work (1983).

As English teachers, we may find terms like *metacognition* a little strange. That doesn't mean that the concept is new. For years, we've had students capture their thoughts in journals. Once on paper, those thoughts could be examined and extended. Book One of *Thinking through Language* takes the journal a cognitive step further. Student writing becomes a way of observing observations, interpreting interpretations, thinking about thinking. So do other devices for helping students reflect on how their own minds work.

Here we need to suggest a little caution. The point of reflection is not to replace the intuitions that good thinkers rely on (at least in the initial stages of thinking). Bringing those intuitions to the surface allows us to check, adjust, and confirm them. That makes intuition even more powerful.

For all these reasons, Book One of *Thinking through Language* involves students in reflective as well as active thinking, and language is the primary means of doing both. As English teachers, we need little convincing that reading, writing, talking, and listening are all means of thinking. The problem is to convince our students and to help them learn firsthand to think through language.

Thinking about Learning

The brain learns naturally. Jerome Bruner finds "the will to learn" so deeply ingrained in human beings that it is almost involuntary (1966). Frank Smith claims that we cannot stop learning (1983). In school, the problem for teachers is that students may not learn what we want them to learn, especially such complex behaviors as reading, writing, and thinking. The question is how to channel our students' mental energies toward what we want them to learn—in this case, thinking.

Part of the answer lies in practice. Just as reading and writing are learned by reading and writing, thinking is learned by thinking. There is no substitute for experience, especially in complex human activities. Consider how babies learn to walk and talk. They learn by walking and talking, trial and error, practice and more practice. Those of us who have taught for a while know that

reading, writing, and thinking are no different.

But practice cannot be artificial or contrived. Again, Bruner makes a critical point: students will solve real problems, if given the opportunity. This comes as no surprise to teachers. We've all watched students become deeply engaged in inventing their own solutions but balk at finding prefabricated answers to be checked against a key. We know that real problems leave room for different ways of thinking by minds that have been shaped by one-of-a-kind lives. Authentic practice allows learners to invent their own behavior, to devise and revise ways of doing things important to them (Perkins 1981).

Vygotsky (1962) sees learning in the same way but from a different angle: "Thought is engendered by motivation—i.e., by one's own desires, needs, interests, and emotions." Motivation depends heavily on context. Reading, writing, and thinking aren't learned in a vacuum. Practice must be bonded to what our students bring with them into the classroom and pointed toward what matters to them beyond the school walls.

Within this kind of personal context, students can direct their thinking toward real purposes. According to Perkins, purpose is the essence of "the mind's best work." Creative thinking involves no special processes, just special purposes to marshal familiar operations like noticing, remembering, looking harder, judging, doing, undoing, problem finding, and—above all—selecting. Thinking is less a matter of component processes than their organization and direction. Working toward real purposes can help students learn to organize and direct their own thinking.

Everything we've said in this section so far applies to all learners. We believe that novices and experts alike learn what they practice within an authentic context for a real purpose. What they learn and how they learn it depend on their maturity as thinkers and as users of language.

Learning is growth. It is a developmental process that happens in stages. In writing, these stages have been aptly labeled *fluency, control,* and *precision.* Learners start with what they have—the words in their heads and some intuitions about language. They try out the medium by putting words on paper. First attempts may be crude and approximate; but with lots of practice and support, fledgling writers gain ease and confidence. Gradually, fluency brings control. Writers begin to think about their readers. Their intuitions become more informed. They experiment with alternatives and attend to form. But control takes time. It also takes practice. With enough of both, experienced writers stretch toward precision. It takes maturity to reach conscious decisions about structure and style, to make critical judgments, and to do a thorough job of revision (Kirby and Liner 1981).

Like writing, reading is a developmental process—natural and growth-centered. So is thinking. Learning itself is developmental. Maturity can't be forced. Novices can't leapfrog over fluency and control into precision.

Book One of *Thinking through Language* is shaped by this developmental view of learning. Fluency comes first. Activities start with what students already have—their own stockpiles of personal experience and their own imaginations. Each unit features active, hands-on tasks grounded in perception and open to self-selected approaches. Activities involve students in generating ideas, exploring those ideas in different media, and solving real problems. Students are encouraged to work intuitively and thus build confidence in themselves as thinkers.

The activities in Book One start with fluency, but they don't stop there. They go on to provide opportunities for making connections, exploring relationships, and trying alternative strategies for inventing and problem solving. Collaborative projects develop an awareness of how other minds work. Students are asked to reflect aloud and on paper about their own thinking. All of these activities develop control.

The activities also nudge students toward precision, the stage at which thinking becomes more analytical and critical. Advanced activities challenge students to elaborate ideas, generate predictions, formulate hypotheses, and make judgments. Interwoven are exercises in reflection that help students in monitoring and evaluating their own thinking.

One caution: learners grow through similar stages, but not at the same rate and not in the same way. They certainly don't move in a straight line from fluency to control to precision. These developmental stages overlap; indeed they recycle as learners undertake new tasks and new strategies for thinking. Because learning is so individual and nonlinear, the student text offers abundant options. In fact, each unit features choices within choices. After selecting among alternative tasks, students select their own ways of approaching those tasks.

Teachers, too, have choices. We think that these choices set this program apart from most school texts. We hope that these choices leave you plenty of room to go with your own intuitions as a teacher.

Thinking about Teaching

No instructional program—including this one—can replace a teacher. We believe that people—not programs—make decisions, create a supportive environment, respond to students, and demonstrate what is to be learned.

The latter is especially important. Language learners have been appropriately dubbed "spontaneous apprentices." They learn from people who can already do what they want to do and are willing to help. Students need demonstration. They need models.

Book One of *Thinking through Language* provides models to illustrate both processes and products. Even so, students need *living* models. They need to observe thinking and language in action by a valued adult. That's where you come in.

As a teacher, of course, you must do more than model. You must guide and support learning. How you do so depends on your students—on their needs, interests, and stages of growth.

So much for theory. The rest of this guide gets down to practice. As you consider the detailed suggestions on *how* to teach *Thinking through Language*, we hope you'll keep in mind *why*. We hope you'll keep thinking about thinking, thinking about learning, and thinking about teaching.

Teaching Suggestions

Teachers usually have two big questions about new textbooks: "Why?" and "How?" We hope that the preceding section helped with your whys about Book One of *Thinking through Language*. The rest of this guide will concentrate on the hows.

Before launching into lesson-by-lesson teaching suggestions, let's deal with some general questions. We hope that our answers will help you with ongoing lesson planning and classroom management.

1. What does Book One of *Thinking through Language* teach?

For a detailed answer to this question, you'll want to examine the Instructional Overview on page 3 of this guide. This chart lists both typical activities and the thinking skills featured in each of the four units of the text. Specific instructional objectives are listed in another overview that introduces each unit. You will notice that these objectives focus on thinking—on skills like observing, selecting, arranging, inventing, analyzing, synthesizing, and predicting. Practice in reading, writing, speaking, and listening is abundant, but it is always directed toward these objectives.

2. Must the book be taught straight through, or can units be interspersed throughout the year?

Though we recommend teaching the units in sequence, they need not be taught in one block of time. In fact, we recommend interspersing them throughout the year. Such an approach seems to have at least two advantages: the emphasis on thinking can be sustained over time, and the activities can be integrated with other work in language arts.

3. How can work on thinking be integrated with ongoing work in literature and composition?

We like this question because we like an integrated approach—not just to the thinking skills but to the language arts as well. We realize that you already have a curriculum. You also have a literature anthology and a composition text. We want *Thinking through Language* to blend with what you are already doing and to enhance it.

Before you begin each unit, we suggest that you review the kinds of reading, writing, speaking, and listening listed in the Instructional Overview on p. 3. Decide where related materials in other textbooks might be used to reinforce or extend these practices. Suggestions for slotting in specific pieces or kinds of literature also appear in the suggestions for teaching for each unit.

4. How long will each unit take?

Here, we have to hedge a little because the units are so elastic. You'll have choices among and within activities. All of the work can be done in class. Some can be done outside. Some students will zip through activities, and some will lag. Though the pacing will be largely up to you and your students, two weeks per unit might be a good preliminary estimate.

5. Will the activities in the book require special materials?

The activities *will* take more than pen, paper, and books. That's because students need to anchor their thinking in concrete experience. Any special materials needed for an activity are listed in the treatment of that activity in the suggestions for teaching.

6. What about evaluation?

When we say evaluation, we mean more than giving a grade. We also mean providing feedback on process. In this book, such feedback is especially important because the process is thinking itself. What you and your students really need to know is how well they have thought through various tasks, how effectively they have used particular strategies, and how much they have progressed in understanding how their own minds work. Students must do a great deal of this evaluation themselves. At the end of each unit, students are asked to reflect in writing on the ways they have

thought through various tasks. This self-evaluation complements the teacher's evaluation.

Product evaluation should be relatively easy, since students are asked to save all their work in sketchbooks, portfolios, or special files. In this Teacher Guide, the treatment of each unit concludes with strategies for evaluation. You may use these strategies to evaluate student work, as well as the final products toward which each unit builds.

Teaching the Units

UNIT I: Experiencing the Arts

This unit focuses on perception. It challenges students to think like artists as they take in experience through the senses and then recreate it by drawing, writing, making music, and performing. The unit culminates with a class art festival and the writing of personal reflections on thinking like an artist.

Objectives

Students will

- observe closely, using all the senses
- select and arrange objects, images, and sounds
- associate images, feelings, and experiences
- categorize objects, sounds, and artistic creations
- interpret ideas expressed in a variety of media
- compare and contrast sounds, experiences, and ways of thinking
- plan and monitor sequences of activities
- reflect on the way their minds work.

Collecting Yourself

ACTIVITY:

Making a Sketchbook and a Portfolio (page 5)

This first activity involves students in making their own sketchbooks and portfolios, preferably in class so that they can share the experience. Unless you prefer to assign the activity as homework, assemble a supply of unlined paper, tape, and colored marking pens. Encourage students to show off their finished creations, and take a few minutes to anticipate the art festival that will culminate the unit.

Seeing by Drawing

ACTIVITY:

Drawing Without Looking (page 6)

For this activity, you'll need more manila paper and tape. Before students begin their contour drawings, demonstrate the directions by taping paper to your own desktop and positioning yourself to draw. We strongly suggest you do this exercise with your students and share your drawing with the class. (The same holds true for other exercises in the text.) When students have finished their drawings, model the way partners are to talk about them and the experience of making them. During the sharing session, circulate to offer encouragement. You may wish to conclude the activity with a general display of hand drawings before students store them in their portfolios.

Going Beyond

Take a few minutes to stimulate interest in the independent projects that are called *Going Beyond*. Set a time for sharing—perhaps by arranging a wall display of hand pieces.

To do so, have each student choose a favorite representation of his or her hand and place it face-up on the floor on a wall-length piece of newsprint, butcher paper, or other background material. Have students walk around and study the collection. Ask them to think about which hand

pieces seem to belong together. Ask two or three students to move the pieces according to suggestions made by the rest of the group. Experiment with arrangement until everyone likes the effect. Then secure the hand pieces to the background paper and the whole production to a wall of the classroom.

Thinking Hands

ACTIVITY:

Seeing Dimensions (page 8)

The first part of this activity may be completed outside of class. As part of the follow-up class discussion, you might compile a chalkboard list of words students wrote in their sketchbooks to describe each piece. Note those that seem especially apt.

If you have students with a special interest in art, invite them to bring in pictures of other sculptures and paintings featuring hands.

Seeing with the Senses

ACTIVITY:

Sensory Tour (page 9)

How you handle the tour will depend on the locale and policy of your own school as well as the amount of class time you have available. If it seems best to assign independent after-school tours, encourage students to go in pairs or in small groups. Remind them to take their sketchbooks, perhaps with a copy of the list of directions on page 9.

Since the chalkboard compilation of observations lays the groundwork for further work with categorization, don't rush the activity. Encourage students to listen to items their classmates found in each category. See if they can guess the route of other students' tours. Be sure that students keep their collected items for the next activity.

If your literature anthology contains selections that feature vivid sensory detail, this would be a good time for some related reading.

ACTIVITY:

Tabletop Composition (page 10)

Try to begin tabletop compositions at the beginning of a class period. If students are not accustomed to working in groups, you might ask each group to choose a leader. Space groups as far apart as possible, and suggest that members arrange their chairs in a tight circle. Circulate to keep groups moving. If possible, time activities so that groups can complete their own compositions, see those of other groups, and make sketches during the same class period. If these activities take two periods, students may dismantle and then reassemble tabletop compositions.

The sketchbook reflection may be done in class or out. In either case, invite volunteers to share reflections with the rest of the class.

Going Beyond

Take a few minutes to spark interest in these projects, and make arrangements for sharing.

Seeing Close Up

ACTIVITY:

Paper Camera (page 13)

You will need several pairs of scissors, tape, and string. Be prepared for a little noise in this activity. Set a time limit—probably no more than twenty minutes—to keep students on task as they tour the room and draft their descriptions of newly discovered features.

At this point, you may wish to break for some work on descriptive writing, perhaps using your composition textbook as a resource. Students may

then revise their first-draft descriptions, post their final drafts near the classroom feature described, and circulate to read one another's work.

Going Beyond

After compiling a class list of features described and eliciting responses to the suggested questions, discuss possibilities for the three independent projects described and others. Consider setting up a special bulletin board to display these projects.

Seeing with Words

ACTIVITY:

Colors and Ideas (page 15)

The teacher should have a stack of different colored cards or squares (at least red, yellow, blue, green, black, and white). The cards or squares should be flashed twice to the students. The first time will acquaint students with the various colors. Students should be prepared to answer the first question: "What is your favorite color?" After that exposure, coordinate the exposure of the different colors with the remaining twelve questions in the text so that students will develop the association between color and emotion. Since the follow-up discussion lays the foundation for activities to follow, you will want to take plenty of time.

ACTIVITY:

Mapping a Color (page 15)

If time is a problem, color maps can be assigned as homework. We strongly suggest that you do your own color map and share it with the class. Encourage students to make guesses about what your color map suggests about you as a person. They can then move directly into a similar discussion with partners.

Going Beyond

Set a time for discussing observations.

ACTIVITY:

Mind Maps (page 17)

Since the chain of associations in mind maps may not be obvious to some students, take time to go over the illustration in the book. As students try their hands at an abbreviated mapping of *school,* circulate to be sure everyone has the idea before attempting the more ambitious birthday map.

Before students file birthday maps, you may want to arrange a quick display—perhaps along chalktrays—for general sharing.

ACTIVITY:

Maps into Poems (page 20)

This is another activity that may be assigned as homework if you prefer. Encourage students to share birthday poems with their parents as well as with a friend. Also encourage volunteers to display both their poems and their mind maps. Include those composed as "Going Beyond" projects (page 20).

Tuning in on Sounds

To introduce the next sequence of activities, you might lead the class in an impromptu choral reading of the Eve Merriam poem on page 21. One possibility is to have the first three and the last two lines of the poem read in unison by the whole class and those between assigned as solos, duets, and trios.

ACTIVITY:

Sounds of School (page 21)

Before asking students to begin logging sounds, open a door into the hall and, if possible, a

window. If time permits, you might repeat the activity and compare the second composite log with the first.

ACTIVITY:

Searching Out Sounds (page 22)

In organizing groups to share individual sound logs, you may find it useful to know the scene of each log. You might collect this information on index cards or slips of paper, which may then be sorted as you wish to group students. Try for a variety of sounds in each group.

Going Beyond

Again, take time to stimulate interest in independent projects and set a time for sharing.

ACTIVITY:

Tuning In to Music (page 23)

If at all practical, play a recording in class so that students can share the same listening experience. Choose a rich instrumental piece with a recurring theme and strong dynamics. (The soundtrack from *2001: A Space Odyssey* has some very good examples.) Test your selection in advance by drawing your own line to show how the music moves. You can later share your drawing with the class.

ACTIVITY:

Making Your Own Music (page 24)

Materials: Assortment of sound-makers—ordinary objects like keys, water glasses, and sandpaper. (Students can add to this collection.)

ACTIVITY:

Scoring the Composition (page 24)

Materials: Oversize paper, newsprint, or butcher paper; colored marking pens.

Here you might enlist the help of students who play musical instruments portable enough to bring to class. Ask these students to demonstrate and explain how they read and follow a musical score, which you might reproduce and project using an overhead projector.

In organizing small groups, try to scatter musicians so that each group will have at least one. As groups work, circulate to troubleshoot and encourage.

Make a real production of the class concert. You may even want to invite the school music teacher and other guests. After each rendition, have group members explain their scoring system and respond to questions from the audience. The class might then discuss similarities and differences in the various systems.

Students may answer questions in their sketchbooks at home, but responses should be shared with a partner, a small group, or the whole class.

Performing the Poem

ACTIVITY:

Seeing a Poem (page 27)

This activity provides an important oral rehearsal for those to follow. You may wish to read "Absolutes" aloud twice. A moment of silence should follow each reading so that students may formulate their own responses before hearing those of their classmates. If the ensuing discussion seems hesitant or vague, choose another very graphic poem and repeat the activity.

ACTIVITY:

Seeing More Poems (page 28)

If more than seven or eight students choose the same poem, split them into two groups. When groups are ready to perform, encourage them to introduce their renditions by explaining briefly why they chose that poem. If more than one group performs the same poem, schedule performances

back-to-back and ask the audience to compare them. Also ask the audience for each performance to tell what word pictures came across most vividly.

This might be an ideal time to incorporate a poetry unit from your literature anthology. Since planning sessions for the class art festival can be spaced over several days and much of the preparation done after school hours, there should be plenty of class time for such work.

Celebrating Success

ACTIVITY:

Preparing for the Art Festival (page 30)

Steps in planning the art festival are spelled out in detail in the student book. You need do little more than set an enthusiastic tone, schedule planning sessions, help organize committees, and monitor tasks to be sure all are completed by the big day.

ACTIVITY:

Art Festival (page 32)

Make the class festival a real celebration. If at all possible, invite such guests as the school principal, your department chair, and the art, music, and drama teachers. Encourage students to invite their parents. During the festival, make it a point to chat with each artist and respond personally to each display and performance. You may also wish to take notes for later use in evaluation. When the festival is over, be sure that all work is reclaimed by the owner.

ACTIVITY:

Looking Back (page 32)

Introduce this important culminating task by thinking aloud through your own experience with the unit. Show students your collected works and tell them what task you enjoyed most. Reflect aloud on why. Also talk about how you thought your way through that favorite task and what you consider your best ways of thinking. Use your own oral reflections to lead into a reading of Terri's reflections on page 33.

Reflections may be written at home, but they should be shared with a partner, a small group, or the whole class. Before students hand in their sketchbooks, encourage them to share their reflections with their parents. As you review individual sketchbooks, respond to reflections with a brief note.

STRATEGIES FOR EVALUATION

Before undertaking an overall evaluation of each student's work, you might review the Objectives listed in the overview of this unit (see page 10). Keep in mind that you'll be looking for evidence of these kinds of behaviors, not for artistic virtuosity.

As you review each student's work, you may find it helpful to record your observations on a form like the one opposite. If you prefer not to use such a form, you can develop your own variation of the process suggested below.

1. Review chronologically the work in each student's portfolio and sketchbook. (Exclude the last sketchbook entry since the reflection will be considered separately.) Using the indicators below Line A of the form, circle the number that most accurately shows how thorough that student's work is. In the appropriate space beneath, list the portfolio pieces and sketchbook entries that show the best thinking and those that show the greatest need for more practice.

2. Consider the student's entry in the class art festival and circle the appropriate rating below Line B of the form.

3. Review the final reflection in the student's sketchbook. Focus on details about personal

Student's Name _____

A. PORTFOLIO AND SKETCHBOOK

1	2	3	4	5
Some assignments missing.		Required work complete, but few "Going Beyonds."		Work complete, including several "Going Beyonds."

Work that shows the best thinking:

Work that shows the need for more practice:

B. ART FESTIVAL ENTRY

1	2	3	4	5
A placeholder at best.		Not this student's best work.		Entry well-chosen, well-executed.

C. REFLECTION

1	2	3	4	5
Little more than a summary.		Some awareness of how mind worked through task.		Keen insight into personal strategies for thinking and strengths as a thinker.

strategies for thinking through the task. How much does the student tell about his or her own mental processes and apparent strengths? Below Line C of the form, circle the number that best indicates your rating.

4. Use all of the above plus your own day-to-day observations of the student to arrive at an overall evaluation. The way you translate that evaluation into a grade is up to you.

Resources for the Teacher

Arnheim, Rudolph. *Visual Thinking.* Berkeley: University of California Press, 1969.

This standard work provides excellent reading for the teacher who wants more background in "thinking with the senses" and the role of the arts in cognition.

Edwards, Betty *Drawing on the Right Side of the Brain.* Los Angeles: J.P. Torcher, 1979.

This how-to book by an art teacher is filled with activities adaptable to the language arts classroom with a focus on thinking.

McKim, Robert H. *Experiences in Visual Thinking.* Monterey, California: Brooks/Cole Publishing Company, 1972.

As the title suggests, this is another collection of art activities used to develop perceptual thinking.

Perkins, D.N. *The Mind's Best Work.* Cambridge: Harvard University Press, 1981.

One reviewer called this lively book "a guided tour of the new psychology of creative thinking." If you're attuned to theory and research, we think you'll find it both informative and memorable.

UNIT II: **Exploring Possibilities**

This unit engages students in speculative and imaginative thinking about technology and its future applications. After investigating a particular technology in detail, each student will design a new application to be displayed at the inventors' fair that concludes the unit.

Objectives

Students will

- speculate about the thought processes of other people
- collect and organize information
- brainstorm alternatives
- analyze wholes into parts
- find and solve problems
- evaluate the feasibility of ideas
- invent useful devices
- reflect on personal invention strategies.

To spark interest in this unit, you might ask how many students have at some time in their lives had an idea for an invention—maybe eyeglasses with windshield wipers or a convertible pickup truck. Another idea is to write on the chalkboard, "I wish someone would invent . . ." and ask each student to finish the sentence in three different ways. Encourage free-wheeling responses—not necessarily serious—and move directly into a reading and discussion of the unit introduction on page 36.

Spotlight on the CRV

As a way of stimulating students into imaginative realms, spend a few minutes discussing the deliberately outrageous idea of a bus controlled by individual passengers.

Inventor at Work

Pursue the track of an inventor who saw a problem but could come up with no practical solution. Encourage students into the role of an inventor, at least so far as perceiving problems and imagining solutions.

ACTIVITY:

Inventor's Notebook (page 38)

One time-saving possibility for this activity is to alert students the preceding day to bring a tablet, notebook, or folder that they can decorate in class. Another is to put together the notebooks in class and have students personalize the covers at home. In either case, be sure that everyone has the necessary materials. Also, hold a brief show-and-tell to share inventors' notebooks.

Pushing the Limits

ACTIVITY:

Second-Guessing Inventors (page 39)

To ease students into this sequence of activities, you might choose one of the ten devices listed on page 39 and speculate aloud about how it might have been invented. Tell your own impromptu story, just as students will be asked to do. As they begin to work individually and in pairs, circulate to offer support. Compliment good ideas. If someone is snagged, ask helpful questions. If your composition text includes a good chapter on narrative writing, you might want to incorporate it at this point. If students' stories are developed into polished products, compile them into a class anthology or display them on a bulletin board—perhaps with illustrations. Students will need their stories for reference as they work in small groups to list characteristics of the inventors portrayed.

After the class compilation, you might ask a volunteer to capture characteristics on a poster.

Looking Ahead

New Technologies

Ask students to jot down the first five words that come to mind when they hear the word *technology*. Use those associations to lead into a reading of the "New Technologies" section at the bottom of page 41 and a discussion of the upcoming inventors' fair.

ACTIVITY:

Ranking Technologies (page 42)

After rankings are complete, take plenty of time to talk about each technology and discuss ways each is likely to change our lives. Link this discussion to the *Going Beyond* projects that follow.

Going Beyond

Explain that these independent projects will extend over several days as the class moves ahead with other activities. Set a time for sharing results.

ACTIVITY:

Taking Stock (page 43)

Since work groups for this activity are formed on the basis of interest, they may not be balanced in size. If a group includes only one or two students, you might encourage volunteers to shift—but only if they have a real interest in a particular technology. As groups work, circulate to help them stay on track. Students may need help in summarizing what they already know and identifying gaps in that information. If groups falter in identifying sources of information on their technology, allow representatives to consult with the school librarian.

It might be best to schedule presentations for the next day to allow more thorough preparation. Each group should conclude its overview by inviting questions and contributions from the class. After a wrap-up discussion, take an informal poll to see which technology each student now prefers to work with. Before organizing new interest groups, give fans of each technology a chance to "sell" it to their classmates. After students have made final decisions, organize technology groups that will work together for the rest of the unit.

ACTIVITY:

Organizing to Find Information (page 45)

Though important to group rapport, choosing a name and designing a logo need not take much time. After decisions have been made by the whole group, a subcommittee can construct the poster after school.

If your composition textbook includes a good research unit, you may wish to incorporate it at this point. Serve as a consultant as students organize their information search. Schedule periodic meetings and monitor the progress of each group.

Going Beyond

Set a good example by making your own contributions to each group's collection center.

ACTIVITY:

The Technology Display (page 46)

Students will need material for the large wall chart. Be sure that they understand in advance the necessary content for the three sections described on page 47.

Brainstorming Alternatives for Individual Inventions

After students read this section, ask why they think the process described is called brainstorming. What does the term imply? You may wish to write the four ground rules for brainstorming on the board.

ACTIVITY:

Brainstorming Warm-Up (page 48)

Remember to appoint at least two recorders so that ideas can be captured as fast as they are called out. Participate in the class brainstorming session yourself. Keep it going as long as you can. Then move quickly into small groups for more practice. After sharing lists generated in groups, talk about the experience of brainstorming. Be sure that everyone understands the process before moving into the next activity.

Brainstorming Changes

Remind students that they will continue meeting with their technology groups to compile research findings. Meanwhile, they will form new ad hoc groups to explore areas in which their technologies might be applied. This exploration will help stimulate ideas for an invention that applies their technologies in a new way.

ACTIVITY:

Brainstorming—Past, Present, and Future (page 49)

Since this activity is rather challenging, we suggest that you begin with a practice session in which the class brainstorms musical instruments through the ages. Ask what might have been used to make the very first music. What might have been used next? Keep going to the present. Don't worry about exact sequence. Just have the class keep naming kinds of musical instruments as a recorder lists them on the board. Later, students can see how items on their list compare to those on the model time line (page 49).

As groups begin their own brainstorming, circulate so that you can offer any help that may be needed.

Going Beyond

After each group has shared its time line and projection of future possibilities, introduce the "Going Beyond" projects and make arrangements for sharing.

Focusing Problems

Recall the histories brainstormed by small groups. Ask what breakthroughs seemed to bring about the greatest advancement in each area. Against this background, ask students to turn their attention to the present—to the current state of homes, schools, recreation, work, and transportation. Suggest that the next sequence of activities will help them identify problems in these areas that technology might be able to solve.

ACTIVITY:

Thinking Trees (page 50)

Let students work through this section independently. Then field questions and brainstorm future inventions that might solve problems of car safety, pollution, and traffic. Continue the same process with other types of vehicles. Be sure that students understand the method of analysis illustrated by the sample thinking tree on page 52 and how it branches down to stimulate ideas for invention.

ACTIVITY:

More Trees (page 53)

You may wish to have groups complete one tree, then reconvene as a class to compare and discuss their work. This way, you can clear up any problems before the problems carry over to other trees. Remind students to copy completed trees in their inventor's notebooks for reference during the next activity.

ACTIVITY:

Using Your Trees (page 54)

This activity may be assigned as homework or completed in class.

ACTIVITY:

Outside Consultants (page 54)

Ask volunteers to share entries from their inventor's notebooks and to talk about the experience of working with outside consultants.

By this time, the technology groups should have finished most of their research. Explain that the questions on page 55 will help them review that research and relate it to problems identified on their thinking trees and to possible inventions. Discuss the model problem statement provided on this page. Before group work concludes, be sure that everyone has at least one idea for an invention to solve a particular problem.

ACTIVITY:

Writing a Problem Statement (page 56)

At least some of this work should be done in class so that students may consult with other members of their technology groups. When problem statements and visuals are ready to be shared, reconvene the groups.

Inventors' Fair

ACTIVITY:

Designing Your Own Invention (page 56)

This activity will take time. After students get started, much of the work can be done at home. Meanwhile, you may want to spend class time on literature—perhaps nonfiction by writers who are also scientists or inventors. Since students will soon be explaining their inventions in writing, another possibility is to read expository essays from your literature anthology or current magazines.

ACTIVITY:

Explaining Your Invention (page 57)

You may need to ease students into this assignment with some oral rehearsal. Have volunteers talk through what they might write in each section outlined on pages 57–58. Monitor progress as students draft their papers.

ACTIVITY:

Revising Your Explanation (page 58)

If you think more help is needed before students undertake final drafts, incorporate appropriate work on expository writing from the composition textbook your class is using.

Preparing for the Fair

Make the fair an occasion for celebrating the hard work students have done on their inventions. You may wish to invite parents and other special guests.

ACTIVITY:

Displaying Your Individual Invention (page 59)

Students will probably need to prepare their individual exhibits at home. Students' written explanations should accompany their graphic display, three-dimensional model, or other type of presentation.

ACTIVITY:

Displaying Your Thinking Processes (page 59)

Be sure that this important reflection activity gets more than cursory attention. You might help students get started by modeling the development of a time line or map tracing different stages of thinking through a particular invention problem.

After the inventors' fair is over and exhibits have been dismantled, ask students to look back at the early pages of the unit and the early entries in their inventor's notebooks. Suggest that they reexamine their earlier assumptions about inventors. Now that they have tried their hands at inventing, do the students have a different view of what it means to think like an inventor?

STRATEGIES FOR EVALUATION

For this evaluation, you will need to collect inventor's notebooks and have individual projects available for review. Any notes you have taken during observation of classroom activities will also be helpful.

If you like to record observations on a form, we recommend the one opposite. If you don't find such a form useful, develop your own version of the process suggested below.

1. Review chronologically the entries in each student's inventor's notebook. (Exclude the final explanation of the invention since it will be considered separately.) Using the indicators below Line A of the form, circle the number that best indicates the thoroughness and quality of that student's work.

2. Recall the student's contributions to such activities as group research, brainstorming, construction of thinking trees, and the inventors' fair. Below Line B, circle the number that most accurately rates that student's contribution to collaborative projects.

3. Study the student's individual entry in the inventor's fair, both the display itself and the written description in the inventor's notebook. Circle the appropriate rating below Line C of the form.

4. Consider the student's display of personal strategies for invention. How much does the display show about the student's own thinking processes? Below Line D of the form, circle the number that best indicates your rating.

5. Weigh all of the above factors. Consider also any insights gleaned in day-to-day observation of the student at work. As in Unit 1, the way you arrive at an overall evaluation and the way you translate that evaluation into a grade is up to you.

Resources for the Teacher

Adams, James L. *Conceptual Blockbusting.* New York: W.W. Norton, 1979.

Author James Adams—an engineer by training and a teacher by trade—calls this a "think-along" book. We recommend it not so much for the problem-solving exercises as for the stimulating discussion of ways to open up the thinking process.

de Bono, Edward. *Lateral Thinking: Creativity Step by Step.* New York: Harper & Row, 1970.

This book suggests a wide array of strategies for breaking the rigid patterning of logical (vertical) thought and thus generating creative

insights and ideas. Many activities are easily adaptable to classroom use.

Osborn, Alex. ***Applied Imagination.*** New York: Charles Scribner's Sons, 1953.

Now in its thirty-first printing, this book has become a classic of its sort. Though the theoretical sections seem a bit dated, we think you'll find it worthwhile to look into the chapters on idea finding, creative collaboration, brainstorming, and idea production.

Student's Name _____

A. INVENTOR'S NOTEBOOK

1	2	3	4	5
Some entries missing.		Work complete but sketchy.		Entries rich and thoughtful.

B. GROUP COLLABORATION

1	2	3	4	5
Lets others carry the group.		Usually pulled own weight in group activity.		Excelled as brainstormer, team contributor, and consultant.

C. INVENTION AND EXPLANATION

1	2	3	4	5
Shows little time and thought.		Idea has possibilities, but presentation a little muddled.		Idea promising. Clearly presented graphically and in words.

D. DISPLAY OF THINKING PROCESS

1	2	3	4	5
Just a list of activities.		Some awareness of own way of thinking through invention process.		Strong grasp of own thinking strategies; well displayed.

UNIT III: **Investigating the Issues**

This unit engages students in a study of their own school. The challenge is to think like a researcher—to ask questions; collect, analyze, and synthesize information; and interpret and evaluate findings. During the investigation, students design their own surveys, conduct field research, and compile results. The project culminates in the publication of a collaborative State of the School Report.

Objectives

Students will

- formulate questions
- design and conduct surveys
- analyze and synthesize information
- generalize from a collection of details
- evaluate research findings
- draw conclusions from a large body of data
- make critical judgments to set priorities.

Before launching this unit, you'll want to alert your principal and fellow faculty members to the investigation students will be conducting. Explain that the intent is constructive, as students will be searching out strengths of the school and looking for ways to make it even better. Also ask for cooperation in responding to surveys and promise to share the results of the study.

Different Kinds of Researchers

In introducing the unit in class, you may wish to set up a collection box for news items about researchers and their work. Ask students to drop in notices of clippings being added to the researcher's files they will be keeping later, as well as informal summaries of accounts they've heard on radio or television. Periodically, throughout the unit, take a few minutes for students to present the items about research they've found reported in the media.

ACTIVITY:

Thinking about Researchers (page 63)

After students have shared their five-minute writings in a small group, you might suggest that each group choose one to read aloud to the rest of the class. After a follow-up discussion, remind students that all writing should be kept for the researcher's files they will start later.

Tools of the Trade

Trivial Pursuits

Consider introducing the idea of a trivia game with your own impromptu trivia that deal with the details of your particular school.

ACTIVITY:

Tracking Down Trivia (page 64)

If at all possible, allow time for students to take one another's trivia quizzes.

Going Beyond

Call attention to the options listed on page 65 and encourage participation.

Research Workshop

The following series of practice activities will take students through the whole process they will

apply later in their survey of the school. Since instructions in the text are very detailed, you should be free to manage and support.

ACTIVITY:
Developing a Survey (page 66)

In organizing groups, remember that teams will remain together throughout the workshop. Try for a good mix of strengths and interests in each. Because of inexperience, even strong groups will need plenty of time and guidance in developing survey questions and in compiling results. Be sure to have large sheets of chart paper or posterboard ready for use in displaying results.

ACTIVITY:
Survey Exchange (page 68)

You will need to designate groups and monitor the exchange of surveys.

ACTIVITY:
Compilation (page 68)

Although the instructions for group work in the text are very specific, you may need to advise groups on procedures to follow.

ACTIVITY:
More Compilation (page 69)

You may wish to designate a spokesperson for each group as you make the chalkboard compilation.

ACTIVITY:
Interpreting Results (page 70)

In the class discussion, you may wish to focus on the totality of the information compiled as well as the most interesting features of the data.

Going Beyond

Since interpretation and reporting of results are so important, you may want to require each student to complete one of the activities listed on page 70. After getting started and gaining a little momentum in class, students may finish these projects as homework. Be sure to provide an opportunity for sharing. Also, remind students to keep all work for their researcher's file.

School Project

This preview sets the tone for the rest of the unit. Stress the importance of being positive and making a real contribution to the school.

ACTIVITY:
Making a Researcher's File (page 72)

Although students may improvise their files at home, allow time for showing them off in class.

ACTIVITY:
Keeping an Investigator's Log (page 72)

Be sure that everyone understands the function of a log. Periodically throughout the unit, check to be sure that students are logging daily activities and noting what works well as well as what does not.

Fact-Finding Teams

In organizing these new teams, try to take into account student preferences. Be sure, however, that teams are about the same size and that each includes potential leaders.

Categories of Questions, Accentuating the Positive, Formats for Questions, and Focus on Respondents

Students may read these sections independently, in or out of class. Since question formats will be new to most students and the material may seem a bit technical, take time for a follow-up discussion. To check understanding, ask volunteers to supply impromptu examples of each type of question listed on page 75. Also take time to talk through the model questions for different groups of respondents.

ACTIVITY:

Developing the Survey (page 78)

Schedule this key activity during class so that you can tune in on group work and assist as needed. Since the quality of the school investigation and the resulting report depend on the quality of the survey instruments, keep working until you and the students are satisfied.

The checklist (page 79) may take a little explanation. After it has been applied, ask each group to explain its ratings to you. Use the checklist to make your own ratings of each group's survey, and share these ratings with the group. Reserve the right to approve surveys before they are duplicated.

ACTIVITY:

Conducting the Survey (page 80)

Surveys will take several days. Set a deadline for completion and use the intervening class time for related activities. Since this unit is light on reading, consider such possibilities as a mini-unit of stories, poems, and essays focusing on school. Save a few minutes each day for a progress report and troubleshooting session on the school survey.

ACTIVITY:

Adding Up Results (page 80)

You may need to help groups get organized for the task of compiling survey responses. Groups will probably need most of a class period to compile and discuss results. Be sure they save a few minutes to plan presentations for the next day.

After all groups have presented their findings, collect tally sheets so that you can duplicate copies or cut sections apart for the next activity. If you do the latter, clip together all sections dealing with the same category of information—for example, Buildings and Grounds. Also in preparation for the next day, check to be sure students have highlighters to use in coding the surveys.

ACTIVITY:

Merging Viewpoints (page 81)

When you organize new teams, be sure that every group includes at least one person from each of the old fact-finding teams. Since the student text contains detailed instructions for merging survey responses, your primary role will be that of consultant. Before reconvening the class for presentations, ask groups to show you their conclusions as well as their lists of strengths and recommendations for improving the school. Presentations will probably need to be scheduled for the next day.

ACTIVITY:

Preparing the Report (page 82)

Write committee assignments on the chalkboard or have a volunteer letter them on poster paper. After committees are oriented to their tasks, set realistic deadlines and schedule time for regular planning sessions.

Going Beyond

Call attention to the optional tasks. Work on the report may then proceed outside of class as you move into the next series of activities.

ACTIVITY:

Setting Priorities (page 84)

After students complete this exercise in critical judgment, recruit a recorder to write the "Proposal for Action" to be inserted as a preface in the report.

ACTIVITY:

Publishing the Report (page 85)

Even though this unit does not culminate in a festival or fair, students need a simple occasion for celebrating their success as researchers and going public with their State of the School Report. Even if their report could not be reproduced, it may be attractively bound and presented to the principal in a classroom ceremony. Part of this ceremony should be a brief oral history of the report delivered by the students who produced it. If resources allow duplication of the report, other presentations may be scheduled.

Going Beyond

Encourage students to publicize the report further by following suggestions noted here.

ACTIVITY:

Looking Back (page 86)

Alert students in advance to bring their investigator's logs to class so that this important reflection activity can receive the time and attention it warrants. If students share their final log entries with partners or small groups, reconvene the class for sharing of highlights. Before directing attention to "A Final View" (page 87), collect logs and contents of researcher's files for use in evaluation.

STRATEGIES FOR EVALUATION

In arriving at an overall evaluation of each student's work during this unit, remember how important it is to consider process as well as product. Since much of the work has been done in teams, your observations of group activities should be especially helpful.

As in the previous units, you may find it helpful to use a form in reviewing each student's work. Consider the one on the next page.

1. Inventory the student's researcher's file and review his or her investigator's log. (Since the final log entry will be evaluated separately, exclude it for now.) Below Line A of the form, circle the number that best represents the quality and thoroughness of the student's work.

2. Recall as much as you can about the student's contributions in all collaborative projects—the trivia hunt, the research workshop, and especially all phases of the big investigation of the school and development of the State of the School Report. Below Line B, circle the number that most accurately rates the student's contribution as a collaborative thinker and investigator.

3. Study the student's final log entry. Below Line C, circle the number that best indicates how well the student has reflected on his or her own strengths and weaknesses in thinking like a researcher.

4. Consider all of the above factors. Consider also any other insights gained as you observed the student work through this unit. As in previous units, you will be the best judge of how to arrive at an overall evaluation and how to translate that evaluation into a grade.

Resources for the Teacher

Though neither addresses thinking directly, both of the following books provide solid reading for the teacher who wishes to extend work that helps students think like researchers.

Macrorie, Ken. *Searching Writing.* Rochelle Park, New Jersey: Hayden Book Company, 1980.

This book centers on the "I-search" approach popularized by Macrorie as a means of involving students in inquiry. Though intended for the college level, ideas in the book are readily adaptable to students of any age.

Moffett, James, and Betty Jane Wagner. *Student-Centered Language Arts and Reading, K-13.* Boston: Houghton Mifflin, 1976.

Firmly grounded in theories of learning and thinking, Moffett's book provides a basic resource for all teachers of thinking through language. Particularly relevant to this unit are Chapter 18 ("Information") and the thinking skills section of Appendix A ("How do students learn? . . .").

Student's Name _____

A. FILE AND LOG

1	2	3	4	5
File almost empty and log pages often blank.		Work complete, but log entries minimal.		Assignments and log 100%—even extras.

B. TEAMWORK

1	2	3	4	5
Contributed little.		Some initiative; usually carried through.		First-rate as planner, investigator, reporter, collaborator.

Most important contribution to investigation:

Most important contribution to report:

C. FINAL LOG ENTRY

1	2	3	4	5
Little or no listing of things done well and not so well.		List adequate, but kinds of thinking not labeled.		Superb analysis of own thinking—kinds done well and not so well.

UNIT IV: **Probing the Future**

This unit challenges students to project, predict, forecast, plan, and imagine what life might be like in the future. Activities engage students in inventing metaphors for the future, sequencing forecasts on a time line, writing future autobiographies, mapping possible consequences of change, and composing scenarios. The unit culminates in a futurists' forum and the making of mind metaphors to show how individual students have gone about thinking like futurists.

Objectives

Students will

- invent and extend metaphors
- sequence events on a time line
- project themselves into the future
- predict consequences
- create scenarios
- reflect on personal strategies for thinking.

Futures units and studies of the future were used widely in schools in the early 1970s. Mini-courses, elective courses, and in-class simulations were popular with students and teachers alike. With the back-to-basics crunch, however, and with the growing "here-and-now" myopia of today, the future is apparently something schools are not supposed to worry about. Futurists such as Alvin Toffler warn about apparent mismatches between growing technological sophistication and the ability of our culture to assimilate and accommodate high-speed change. However, present curricula seem preoccupied with the short range.

We have chosen the futures theme for this unit for two important reasons: (1) We believe young people need to consider their own futures and the future of their culture, and (2) future-looking is a particular kind of thinking which gives students opportunities to use both their imaginative/creative powers and their more rational powers of planning, sequencing, and predicting. Our main goal in this unit is to help students visualize themselves in the future.

Futures File

Students need to be collecting articles about anything in the future. You can get them excited about this activity by bringing in resources and clippings you have found and by creating a visually interesting classroom. The file box idea should serve two purposes: (1) give them a place to keep things, and (2) get them started thinking about the theme.

ACTIVITY:

Making Your File (page 91)

You may want to allow class time for the making of file boxes individually or with a partner. After the sharing, you might have a whole-class discussion about life in 2010. Ask students who have particularly interesting files to share them with the class. Focus especially on the pessimism/optimism question and on their hopes and fears of the future.

The Big Picture

ACTIVITY:

Metaphors for the Future (page 93)

You may want to read each of the four metaphors for the future aloud to the class and discuss each to be sure students understand them before students break into pairs. Students may also wish to modify the metaphors slightly so that they can agree with them. However, be sure they choose the one that most closely matches their own views.

Follow your best judgments about organizing metaphor groups. Students may feel dogmatic about a particular view of the future. The trick here is to facilitate good discussion and an openness of mind rather than to create adversarial relationships between the differing points of view. Remind students that no one knows exactly what the future will be like. These metaphors are hunches and, as such, all are possible.

ACTIVITY:

Brainstorming Metaphors (page 94)

The key to the success of this activity is the brainstorming you do with the class before they begin working alone. Use your best cheerleader behavior to drag out lots of clever metaphors from them. After you are satisfied with the list on the board, you might select one and model the jot-listing procedure which students will do on their own.

Sharing the paragraphs with partners is an important step because partners can offer additional ideas and help sharpen and craft the paragraphs. Provide in-class time for revising the paragraphs and consider using some class time for sharing the finished products. If your students work best when their work is graded, use some kind of check system to show them you have evaluated the paragraphs, but do not spend much grading energy on this assignment.

Going Beyond

Encourage students to try one of the activities on page 95.

Guessing the Future

ACTIVITY:

Forecasting (page 96)

Students may want to consult parents or other adults about some of these fifteen items. You might ask them to take their time lines home to get a second opinion. The small-group part of this activity might be done as a whole-class activity. The important thing here is the attitude of tentativeness and guessing. Enforce the "no arguing" rule.

Going Beyond

The activities on page 97 may be worth time for class discussion, particularly if your students are enthusiastic about the time lines.

ACTIVITY:

The Future and You (page 98)

This activity is included as "pre-thinking" for the autobiography to follow. You may want students to respond to the questions in writing and take class time to discuss their responses. (Telling middle school students to "think about something" is seldom concrete enough instruction.)

ACTIVITY:

Future Autobiography (page 98)

This is an important assignment because it pulls together everything the students have been doing in the unit to this point. Their time lines, their responses to the questions on page 98, and their imaginations are their resources. Students may need help with this assignment. Suggest that they try jot-listing ideas for each installment before they actually begin the writing.

Going Beyond

Sharing future autobiographies is an important culminating activity for the first half of the unit. The ideas in "Going Beyond" may serve this function, or you may wish to ask some students to read their papers aloud to the whole class or maybe in small groups. The point here is to celebrate their good work with recognition of some kind.

Future Wheels

This is a chance for your students to rest a bit from the rigors of writing and to play around with cause and effect in a spontaneous way.

ACTIVITY:

Making a Future Wheel (page 101)

You may need to model future wheels for your class by doing one with them on the blackboard before they launch into one of their own. Finished future wheels might also make good classroom decorations, so think about creating a gallery of these products in your room.

ACTIVITY:

Taking Stock (page 102)

This is an interim activity to check on the progress of students' futures files. It is also an excellent opportunity for students to share some of the articles they have found. (You may need to encourage them to get to clipping if their files are sparse.)

ACTIVITY:

Fictionalized Forecast (page 102)

You may want to tell your students more about Ray Bradbury before they read his story. He is a fascinating character, and your media specialist probably has some biographical data on him.

"There Will Come Soft Rains" is loaded with Bradbury's stunning descriptive prose. We have suggested that students keep a list of interesting words, but you may need to do some preteaching of Bradbury's vocabulary to help students to enjoy the story.

ACTIVITY:

Bradbury Revisited (page 107)

The follow-up discussion with a partner is designed to lead students from Bradbury's story into creating their own scenarios. You might follow up these conversations with a whole-class discussion of the questions.

ACTIVITY:

Starting Your Own Scenario (page 108)

Scenario development is a major assignment for this unit. Probably you will spend several days on the process of writing and rewriting scenarios. The text suggests several ways for students to get started. In fact, the list on pages 108–109 may overwhelm some students. You may want to demonstrate how you would begin the assignment or explain in detail some of the starting strategies listed in the text. The oral sharing of ideas with a partner seems to work well for young writers. Plan your class so that the sharing goes on just before students write their first drafts.

Going Beyond

Encourage students to do one or more of the reading exercises.

Futurists' Forum

Students' sharing of their scenarios should be a rich experience. Real futurists love to get together at forums and try their ideas out on one another. If students plan this activity carefully, it can be truly enjoyable.

ACTIVITY:

Organizing the Forum (page 110)

The futurists' forum is something that community members, local news media, and parents might be interested in. At least consider holding the forum in the school media center and inviting other classes to participate. This is the time for students to show off a bit. The key here is that students need real audiences to appreciate the hard work they have put into producing their scenarios.

ACTIVITY:

Shaping Up Your Scenario (page 111)

Crafting the final draft requires time and patience on the part of both you and your students. Emphasize the fact that finished scenarios are going to be shared with a real audience, so particular care is called for in the revising and polishing of the work. You may wish to modify the four revision questions on page 111 into a revision checklist that partners could have in hand as they help each other.

You may choose not to grade the scenarios on the assumption that high-level creative work is, in many ways, its own reward. On the other hand, scenarios are products to be evaluated. If so, you may wish to use the analytic scale opposite for grading the scenarios.

ACTIVITY:

Taking Part in the Future (page 112)

Encourage a class discussion with an optimal exchange of views about the future.

Thinking Like a Futurist

ACTIVITY:

Mind Metaphors (page 113)

This final activity is an attempt to engage students in metacognition, reflective thinking about how their own minds work. If you are tempted to omit this activity, consider the following: cognitive psychologists do not agree on much, but they do seem to be in agreement about one thing—the importance of thinking about thinking. Monitoring one's own thinking processes and reviewing one's own cognitive strategies are important steps in an individual's continued growth. Also, this final activity is an appropriate finish to the entire program in this book.

STRATEGIES FOR EVALUATION

You may wish to review each of the products students have completed for this unit and evaluate them holistically. If you assigned a grade to the scenarios, you may wish to add that in. Finally, you may wish to assign a grade for class contributions, particularly each individual's work on the forum. The form on page 32 is one structure for evaluation.

Resources for the Teacher

Hollister, Bernard. *You and Science Fiction: A Humanistic Approach to Tomorrow.* Skokie, Illinois: National Textbook Company, 1977.

A wonderful book organized around themes like "What Kind of Society Do I Want?" Full of short excerpts from major science fiction writers.

Hollister, Bernard C., and Deane C. Thompson. *Groking the Future.* Fairfield, N.J.: Pflaum/Standard, 1973.

This clever little book has been around for a while, but it is still useful. It's full of explorations into the future.

Kauffman, Draper L., Jr. *Teaching the Future.* Palm Springs, California: ETC Publications, 1976.

This book is simply the most helpful book on the future as subject matter that we have seen. Kauffman really documents how futurists work and think.

Madsen, Alan L. *Tomorrow: Science Fiction and the Future.* New York: Scholastic Book Services, 1973.

This book is a student activity book or log which takes students through a number of activities on the future.

Toffler, Alvin. *The Third Wave.* New York: Bantam Books, 1980.

Must reading for the teacher who wants to be a knowledgeable resource for this futures unit.

Student's Name _____

Setting

1	2	3	4	5
You need more of a picture of your place. I couldn't see it.		Your setting could be made more vivid by adding more descriptive words.		Strong setting. You put me there!

X4 _____

Specific Details

1	2	3	4	5
The piece is sparse. Can you see places to add telling details?		Some strong details. You could add more.		Excellent use of details!

X4 _____

Surprising and Imaginative Ideas

1	2	3	4	5
Let your mind make leaps. Think like Bradbury.		You're on the right track. Surprise us more.		You're thinking like a futurist!

X4 _____

Mechanics, Spelling, and Punctuation

1	2	3	4	5
Too many errors. They weaken your creation.		Be a careful proofer. Watch for the little things.		Good eyes!

X2 _____

Overall Impression

1	2	3	4	5
Not your best effort. You need to use a partner more.		I like it. With a little more work it could be first-rate.		An excellent piece! You've worked hard.

X6 _____

Total Score _____

Comments:

Student's Name _____

A. FUTURES FILE

1	2	3	4	5
You haven't really given this much effort.		Work complete but sketchy.		Good clipping! A thorough file.

B. METAPHOR PARAGRAPH

1	2	3	4	5
Not a good effort. Spend more time generating ideas.		Some good ideas. Needs more careful revision.		Good thinking! A polished paragraph.

C. TIME LINE

1	2	3	4	5
Not a good effort.		Take more time.		Good-looking time line!

D. FUTURE AUTOBIOGRAPHY

1	2	3	4	5
Shows little time and effort.		Has possibilities, but just isn't polished.		A first-rate piece of writing!

E. FORUM CONTRIBUTION

1	2	3	4	5
You didn't help us out much.		Thanks for your work.		You were a key person in the show!

Bibliography

Anderson, John. *The Architecture of Cognition.* Cambridge: Harvard University Press, 1983.

Berthoff, Ann E. *The Making of Meaning.* Montclair, New Jersey: Boynton/Cook Publishers, 1981.

Bruner, Jerome S. *Toward a Theory of Instruction.* Cambridge: Harvard University Press, 1966.

de Bono, Edward. "The Direct Teaching of Thinking as a Skill." In *The Fourth R: Reasoning.* Ed. Richard M. Bassone. New York: Center for Advanced Study in Education, 1983.

Gardner, Howard. *Frames of Mind.* New York: Basic Books Inc., 1983.

Kirby, Dan, and Tom Liner. *Inside Out: Developmental Strategies for Teaching Writing.* Montclair, N.J.: Boynton/Cook Publishers, 1981.

Neisser, Ulrich. *Cognition and Reality.* San Francisco: W.H. Freeman and Company, 1976.

Perkins, D.N. *The Mind's Best Work.* Cambridge: Harvard University Press, 1981.

Smith, Frank. *Essays into Literacy.* Exeter, New Hampshire: Heinemann, 1983.

Sternberg, R. J. "Criteria for Intellectual Skills Training." *Educational Researcher* 12, no. 2 (Feb. 1983): 6.

Vygotsky, Lev Semenovich. *Thought and Language.* Cambridge: The M.I.T. Press, 1962.

Thinking through Language

Book Two

Instructional Overview

Unit I **Perception**

Cognitive Fields: Perceiving, focusing, organizing, reflecting
Objectives: To improve observation, to evaluate images accurately, to detect stereotypes, to understand points of view and the manipulation of perceptions
Typical Activities: Using all senses in perception, observing patterns of perception, using language to focus perception, explaining impact of mental images and describing their shifts, identifying differences in point of view, describing ways in which emotions affect perceptions

Unit II **Relationships and Connections**

Cognitive Fields: Identifying, inferring, analyzing
Objectives: To improve perception of similarities and differences via analysis of metaphor and analogy, to recognize patterns, to detect irony, to describe relationships accurately
Typical Activities: Recognizing and using metaphor, analyzing and using analogies, identifying logical fallacies, identifying relationships within a system, describing ironic results in a complex system

Unit III **Problem Solving**

Cognitive Fields: Distinguishing, projecting, evaluating
Objectives: To identify and distinguish among kinds of problems, to recognize emotional appeals, to define a conflict, to generate a reasonable solution
Typical Activities: Identifying problem-solving strategies, solving scientific problems as well as problems in interpersonal relationships, evaluating an author's use of emotional appeals, defining conflicts from different points of view

Unit IV **The Creative Imagination**

Cognitive Fields: Exploring the alpha and beta states of cognition
Objectives: To identify alpha and beta states, to induce different modes of thinking for creative problem solving and for creation of personal myths and images
Typical Activities: Observing the functioning of the mind, improving concentration, inducing images, writing a fantasy

A Note to the Teacher

from Barbara Dodds Stanford and Gene Stanford

Even if your students have gone through Book One of *Thinking through Language*, you will probably want to begin Book Two by explaining to them how important thinking skills are and how these skills fit into what the students will be studying in your course over the school year.

You might begin by having the students read the introduction on pages vii–viii and elaborate, through class discussion, on the importance of sound thinking. Or you might wish to stress your own reasons or the school district's reasons for wanting to emphasize thinking skills.

From there, you could move on to explain any new procedures or interruptions in the course program for the year. Specifically, if you are not going to present the four units in one time block—and we recommend that you not do so—you might explain just how the four units are going to be integrated into the course program.

As for the program of Book Two, you might prepare students for some of its different kinds of activities. We suggest, for example, that you have students keep a journal called Reflections. After going over the instructions in the introduction, explain how you plan to read the individual journals and how you plan to evaluate them. It will probably be most helpful if you read the journal entries regularly. Some teachers like to collect them once a week and take them home. Others find they can simply have students put their journals on the corners of their desks during a writing activity. While walking around the class, the teacher can quickly read journal entries and discuss them with the students.

Since the journals are not designed to represent a finished product but rather the process of reflection, you may not want to assign letter grades. If you *do* assign letter grades, make clear to the students that the care with which they reflect on the questions is as important as the quality of their writing.

More important than grades is the quality of feedback you provide on the journals. Many students will not be accustomed to reflective thinking, so you may need to offer encouragement or teach the process. If students balk at doing journal entries or do only a very hurried, sloppy job, be aware that they may find the task very difficult and may need help learning to reflect on their own thought processes. While the questions may sound simple, they require a quite sophisticated ability to recall and analyze one's own thought processes.

If students have difficulty with the journal questions, begin by doing a sample with the class as a whole. Then have students write their entries individually. As you read the journal entries, praise those that are particularly perceptive. For those that are particularly poor, go back through the process with the students, helping them to see what they need to do.

Teaching the Units

UNIT I: Perception

In this unit, students explore perception and the way the mind guides, focuses, and organizes perception. Students also begin the process of reflecting on their own thought processes.

Objectives

Students will

- observe closely, using all of the senses
- observe patterns of perception
- associate vocabulary knowledge with perception patterns
- use language to focus perception more effectively
- explain the impact of mental images on perception
- describe shifts in mental images
- explain when shifts in mental images are needed
- identify differences in point of view
- explain the advantages of hearing different points of view
- describe the role of differences in perception in creating conflict
- list three ways in which environment affects perception
- describe ways in which emotions affect perception
- create a description of a scene that affects the emotions in a particular way.

Lesson 1: Observing the World and Your Mind

ACTIVITY:

Observing Your Surroundings (page 3)

For this activity, students will first individually list all of the things they perceive around them. A time limit of three minutes is suggested to encourage students to begin work quickly. If, after about two minutes, you feel that students need more time, extend the time. However, do not allow this activity to become an exhaustive description. The purpose of this activity is primarily to generate data for the discussion. If most students have about ten items on their papers, they will be able to do the rest of the activity well.

After they complete their lists, students are asked to form groups of four or five students and to select a leader and a recorder. For this activity, the small groups can most effectively be formed by asking students to turn to face the people nearest them—perhaps explicitly telling row one to face row two, etc. As students are moving, you might walk around the class, finding groups for those sitting in odd corners and encouraging groups to move together so hat all can see and hear well.

If your students are not used to working in groups effectively, you might appoint the chair and recorder using one of the following devices:

a. The recorder is the tallest person, and the chair the shortest.

b. The chair is the person whose first name begins with a letter nearest the beginning of the alphabet, and the recorder the person with a letter nearest the end.

If you anticipate that the groups may have trouble figuring out how to answer the questions, you might prepare a chart like the following for the recorder.

Sample Chart

people
clothing styles
furniture
colors
smells
sounds
shape and dimensions of room
details of walls, ceiling, etc.

When students finish this activity, ask them to save their lists because they will use them in the next activity.

Reflection (page 4): This will be the students' first entry in the reflection journals. Remind them that entries should be made in a separate notebook or in a special section of their class notebooks.

ACTIVITY:

Learning to Focus (page 4)

Ask students to read individually the selection "Classroom Lighting Design" and then to observe the classroom again, making a new list of things that they can now notice.

Then have students observe once more, trying to look at the room according to the role suggestions (fire safety inspector, security agent, etc.).

As students are making their new lists, circulate through the class, noting which students are doing the activity well and which ones are having trouble. Offer suggestions to those having difficulty. Then help students find partners with whom to compare lists.

When partners begin to finish their discussions, you might reflect on the exercise with the whole class by discussing some of the following questions:

1. Why were you able to see new things after reading "Classroom Lighting Design" or while pretending to be, for example, a security agent? How did you observe differently?

2. Were any of the words on the "Classroom Lighting Design" diagram new to you? Had you noticed the kinds of lights before you knew labels to describe them?

Language and Perception

ACTIVITY:

Naming Your World (page 6)

This exercise will be more successful if you read aloud the directions from the text for the first step (writing a descriptive paragraph) so that students do not look ahead at step two. After most of the class has completed the paragraph, read aloud or assign step two.

Assign students to groups in the same manner as in the previous activity. (If you are doing this activity the same day, simply ask students to get back into the same groups.)

Reflection (page 8): After completing the group part of this activity, bring the class back together and lead a brief class discussion based on the questions in "Reflection." Then have students write in their journals their own suggestions for improving observation.

Going Beyond

These three activities will need to be done at least partially as outside assignments. You can either let students choose among the three activities or assign everyone to gather data for one of the activities. Those data can then be used as the subject of a class discussion the next day.

Reflection (page 9): Before students write the paragraph noted here, you might have them reflect in a discussion on the way their vocabularies and perceptions have changed in the last five years. What things do they now notice and label that they were not aware of five years ago?

Lesson 2: **Images and Reality**

ACTIVITY:

Images in Your Mind (page 10)

After students look at the puzzle individually, lead the class in a discussion based on the questions in the text. These kinds of questions require a good bit of thought, so allow students ample time to ruminate. Students may be quite unsure of their answers, so emphasize that in these reflective discussions there are no wrong answers. All students will be sharing their own unique experiences.

Inadequate Images

To illustrate the concept of inadequate images more vividly, do the following activity. (This activity is not included in the text because seeing it in advance would give away the answers.) You will need a ruler or something else a foot long, and four small objects. (Jars or cans are ideal, but any small object will do.)

First ask for two volunteers who can place the objects one foot apart. Have a clear space on your desk where students can put the objects, but do not say that they should put them on your desk. This part of the activity should be very easy. Next, ask a volunteer to place a third object one foot from each of the others. Students should easily be able to place the third object so that it makes an equilateral triangle with the others. Then ask who can put the fourth object one foot away from all three of the others. At first, avoid calling on students who are good in geometry. Most people will try to place the fourth object on the same plane as the other three objects. After considerable experimenting they will conclude that there is no way that the four objects can be placed equidistant from each other. Perhaps a good geometry student will guess the solution: the fourth object has to be placed above or below the other objects.

If your class is too sophisticated in mathematics for this problem, a similar but somewhat more complex problem can be found in Edward de Bono's *Lateral Thinking* (1970, 31–35). Pages 1–61 of this book provide good background reading, along with several other exercises on the skills taught in this lesson.

ACTIVITY:

Outgrowing Inadequate Images (page 12)

To introduce this activity, you might begin by giving some examples of your own experiences in outgrowing inadequate images, or you might remind students of literature they have studied recently in which characters discovered that their images of reality were wrong. For example, in the "Out, damned spot" soliloquy in *Macbeth*, Lady Macbeth recognizes that she had not thought about the impact of Duncan's murder on her own conscience. And Macbeth, in his confrontation with Macduff, recognizes that events he had assumed were impossible could be interpreted a different way. Your personal examples might be drawn from the list of suggested ideas, or you might recall such a realization occurring in your class or in recent current events.

In most classes the ensuing discussion will work best as a whole-class activity. However, if your class has been doing well with small-group activities, the questions can be discussed in groups.

Stereotypes

ACTIVITY:

Outgrowing Stereotypes (page 13)

At a certain point in adolescence some students resist working in pairs, particularly if they are paired with someone who could be perceived as a possible romantic partner, or with someone who is particularly unpopular. If you anticipate this problem with your class, discuss the importance of learning to work on a business or school project with *anyone*, whether you would associate with that person socially or not. You might ask

what would happen to someone who worked at a fast-food restaurant and refused to serve people he or she didn't like, or a repairperson who only repaired cars for people he or she liked. Point out that in the world of work, people are expected to be able to work with anyone, and that students need to practice that skill in class.

Give students a time limit of five to ten minutes for this activity, and then extend it if students are not finished and are discussing well. Circulate around the class, giving suggestions to pairs who are having trouble discussing. Listen for interesting examples, key ideas, and ideas students have trouble understanding. Use these for a very short summary discussion with the whole class.

Going Beyond

You may assign students to do one of these activities as homework, or you may assign the whole class to work on one of them. If you are studying an appropriate literature selection, you might do the first activity together. Besides the stories listed in the second activity, many other stories are appropriate for learning about images of reality. Almost any story in which a character has a major insight or attains understanding, or which deals with the theme of initiation, can be studied with the same questions.

Lesson 3: **Point of View**

ACTIVITY:

Noticing Different Points of View (page 15)

Circulate through the class as students are working on this assignment. As they finish with the first part, tell them informally to go on to the second part and to compare their answers with those of their classmates. Help people find others to work with if necessary. Listen to their discussions. After most of the class is finished, briefly summarize the main points you heard. You might also discuss with the whole class any points that several people seem to have trouble with.

ACTIVITY:

Using Different Points of View (page 16)

Have students write the descriptive paragraph, then divide the class into small groups of four or five. Circulate through the class, making sure that all groups are working well. If your students have been having trouble with small-group work, you might provide a sample chart on the board. Show two columns, one labeled "things everyone agreed on" and one labeled "things only a few people thought of." Discuss the remaining questions with the whole class if you prefer.

Reflection (page 17): Ideally, this writing activity should be done immediately after the main activity.

ACTIVITY:

Point of View and Conflict (page 17)

We suggest two alternatives for managing this activity. You could assign students to do the first part of this lesson individually, or you could assign partners at the beginning of the exercise. Have one partner write the paragraph from the mother's point of view and the other from the son's point of view.

Next, divide the class into small groups to discuss the questions on point of view and to prepare skits.

Before students begin presenting their skits, put a chart on the board with one column labeled "things that hinder understanding" and the other labeled "things that help understanding." After each skit, ask students to suggest new ideas to add to the chart.

Reflection (page 18): This assignment can be done in class or at home.

Lesson 4: **Emotions, Perceptions, and Manipulation**

ACTIVITY:

Perception and Environment (page 19)

Have students write their answers for the multiple-choice exercise individually. Then read through the exercise, having students raise their hands for the ones they marked. Note which answers most seem to agree on and which reveal sharp differences. Ask if students have any ideas about the reasons for differences in perceptions.

ACTIVITY:

Manipulation of Perceptions (page 20)

Observe the class as they are writing the descriptive paragraph. After students finish writing, have them share and discuss with partners, as noted in the text. You might also have several students read their paragraphs aloud and ask the class to guess which atmosphere was being created.

Reflection (page 21): After students do this reflection exercise, you will probably want to collect journals if you have not been looking at them regularly.

Resources for the Teacher

de Bono, Edward. *Lateral Thinking: Creativity Step by Step.* New York: Harper & Row, 1970.

Freire, Paulo. *Education for Critical Consciousness.* Trans. Myra Ramos. New York: Continuum, 1981.

Kuhn, Thomas S. *The Structure of Scientific Revolutions.* Chicago: University of Chicago Press, 1962.

Stanford, Gene, Chester R. Cromwell, William Ohs, and Albert E. Roark. *Becoming: A Course in Human Relations.* Philadelphia: Lippincott, 1975.

Winn, Denise. *The Manipulated Mind.* London: The Octagon Press, 1983.

UNIT II: **Relationships and Connections**

This unit explores three kinds of relationships and connections: comparisons (especially metaphor and analogy), whole/part relationships, and the creation of new relationships.

Objectives

Students will

- identify the similarities implied in metaphor
- use metaphor for creative thinking
- identify words based on metaphor
- describe the impact of metaphor on the meaning of a poem

- use metaphor to write a poem
- answer analogy questions
- analyze an analogy
- use analogies in writing
- identify logical fallacies in the use of analogies
- recognize the pattern of analysis
- write an analysis paragraph
- distinguish objects which can be analyzed usefully from those which cannot
- describe limits to analysis as a method of thinking
- construct a web chart to show relationships within a system
- describe ironic results in a complex system
- identify situations in which ironic results are likely to occur
- recognize relationships which change over time
- describe the roles of humans in changing relationships
- identify nonverbal behavior involved in creating human relationships
- describe the evolution of a relationship over time.

Lesson 1: **Comparisons**

Read aloud or assign students to read "The Blind Men and the Elephant."

ACTIVITY:

Seeing Connections (page 26)

The first part of this activity is identified as an "On Your Own" exercise. However, since this is the opening activity for the unit, you may want the whole class to work together. Put the chart on the board and lead the class in a discussion based on the questions in the text.

Reflection (page 27): This exercise can be done either in class or as an assignment at home.

Making the Strange Familiar

If your students have not studied metaphor previously, you might read this section with them and give them a few more illustrations of metaphor. Note that the next main section distinguishes between metaphor and simile.

ACTIVITY:

Words from Metaphor (page 28)

This activity can be done with the whole class, in small groups, or individually. Small groups may be most successful on the second part of the activity (listing other metaphorical words) if you challenge them to see which group can come up with the most examples. Let the group with the most examples read off its list.

Metaphor and Poetry

If you have taught metaphor, simile, and personification, you will want to go over this section with students. If you have not and do not intend to teach these concepts, you can simply skip this section. The unit itself does not require students to distinguish among the three kinds of comparison.

ACTIVITY:

Metaphorical Effects in Poetry (page 29)

Students may try rewriting the poems individually, as noted, or they may put the metaphors into ordinary language in small groups. The discussion of the meanings, however, should be done as a whole-class activity with you as leader. Answers may vary considerably, so do not reject any answer that students can substantiate. Continue discussing each image until you are sure

that the whole class has at least one clear interpretation of it and that everyone recognizes the impact of the metaphor.

Reflection (page 30): This exercise may be done at home or in class.

Lesson 2: **Understanding Analogies**

Analogy Questions

Ask your students how many of them have taken tests with analogy questions. Ask those who have to explain the form and to try to recall some examples. If most are unfamiliar with this type of test item, you might put some examples on the board.

ACTIVITY:

Solving Analogy Problems (page 32)

If most students are familiar with analogy questions, have them write the answers and then simply go over them. The answers are 1-d, 2-a, 3-b, 4-c, 5-d, 6-b, 7-c, 8-a, 9-d, 10-b.

Discuss the strategies students used to figure out the answers.

Making the Familiar Strange

Read aloud or have a student read aloud the "Leadership" passage.

ACTIVITY:

Analyzing an Analogy (page 34)

Lead the class in a discussion of the passage using the questions in the text or rephrasing them in your own words.

ACTIVITY:

Writing with Analogy (page 34)

List the two columns on the board and, starting with the top item on the left side, ask students to brainstorm all of the items on the right side that it could be compared to. Students should give a sentence or two showing the relationship between the items.

Then have students choose one of the metaphors to use as the basis of a paragraph or short essay.

Problems with Analogies

Bring examples of arguments from analogy from newspapers or news magazines and discuss them in class with the students.

Going Beyond

If most of your students do not have access to a newspaper that has a good "Letters to the Editor" section, find some examples and make copies of them for the students to analyze. An alternative is to assign a few students to find examples in the library and assign the rest of the class to analyze the examples.

Lesson 3: **Relationships between Wholes and Parts**

Analysis

If you have previously taught analysis in composition, you can remind students of their previous lessons and have them go right on to the next activity. If you intend to teach analysis at some point, you might add some of your usual composition lessons to this lesson. If analysis is not included in any other part of your curriculum,

go over the introduction to analysis in the text carefully and give more examples if students need them.

ACTIVITY:

Understanding Analysis (page 36)

Use this activity to find out how well your students understand the concept of analysis. Students may discuss the questions in small groups, as noted, or the discussion could be a whole-class activity. Another alternative is to have students write out the answers to the questions. If a number of students have difficulty with this exercise, give them another example and further explanation before going on to the next activity.

ACTIVITY:

Writing an Analysis (page 37)

You may want to collect students' analysis paragraphs and grade them as writing assignments. Note particularly the effectiveness of each student's analysis.

ACTIVITY:

The Limits of Analysis (page 38)

You will probably want to lead the class in this discussion. There are no purely right or wrong answers. However, students should be able to distinguish between a clock (in which the whole is little more than the parts) and a person (in which the physical parts can predict only a small part of the whole).

ACTIVITY:

More Limits to Analysis (page 38)

This activity is identified as an "On Your Own" exercise. However, you may choose to make it a whole-class or small-group activity.

Reflection (page 39): This exercise may be done at home or in class.

Going Beyond

This assignment can be collected and graded as a way of determining students' comprehension of Lesson 3.

Lesson 4: **Thinking about Systems**

To begin this lesson, write a definition of "system" on the board.

Seeing the Web of Relationships

Have students read aloud this section, or summarize it and do a sample web chart on the board. For more detailed description of the use of the web chart, see *Resource Manual for a Living Revolution* (Virginia Coover et al. 1977, pp. 250–253).

ACTIVITY:

Observing Relationships within a System (page 41)

This assignment can be done in class or at home. If students have trouble understanding a web chart, you may want to do it in class, where you can help give them ideas.

After students have completed their charts, divide the class into small groups for discussion. You may also involve the whole class in an evaluation of the charts by using an overhead projector. Make transparencies of several charts and have the class follow the causal relationships which the person has described. Discuss whether they seem believable. Note if a chart has slipped into mixing other relationships.

Unexpected Results

Assign students to read the passage provided here or read it together in class. Ask students comprehension questions to be sure they understand the passage. Also go over the chart on page 42 to be sure they understand it.

ACTIVITY:

Diagramming an Ironic Situation (page 42)

Have several students put their groups' diagrams on the board. Note the similarities and differences among the diagrams. There are some variations in the ways the diagram can be drawn. However, point out examples of inaccurate description of relationships.

Going Beyond

If some students in your class do not have access to a daily newspaper, bring some sample stories to class and pass them out. The rest of the exercise may be done in class or at home.

Lesson 5: **Creating Relationships**

Assign students to read or summarize the introduction to this lesson.

ACTIVITY:

Analyzing Changing Relationships (page 44)

This activity is identified as a small-group exercise. However, you may choose to do it as a whole-class activity using the questions in the text or adapting them to your own style.

ACTIVITY:

Changes in Human Relationships (page 46)

Have students read the poem, then discuss the questions on interaction as a class. The "chance encounters" may be handled in one of two ways. You may assign partners and require every pair to perform an encounter, or you can make a game of the procedure. Students could choose their own partners, develop their encounters, and then volunteer to perform before the class.

Going Beyond

This assignment could be a major research project or just an overnight assignment. For example, it would be an excellent joint research paper assignment with the history teacher. Decide how large an assignment you want it to be and suggest that students choose topics appropriate to the length of time you are giving them. You may suggest other topics based on local experiences or on topics recently studied in History.

You may want to grade this assignment as a major culminating activity to Unit 2.

Reflection (page 47): This reflection can also be graded as a culminating activity for the unit.

Resources for the Teacher

Bertalanffy, L. von. *General System Theory.* New York: Braziller, 1968.

Coover, Virginia, Ellen Deacon, Charles Esser, and Christopher Moore. *Resource Manual for a Living Revolution.* Philadelphia: New Society Press, 1977.

de Rosnay, Joel. *The Macroscope: A New World Scientific System.* New York: Harper & Row, 1979.

Lewis, David, and James Greene. *Thinking Better.* New York: Rawson, Wade Publishers, Inc., 1982.

UNIT III: **Problem Solving**

In this unit, students will refine their problem-solving skills. They will learn to distinguish between scientific problems, which involve the manipulation of inanimate objects, and interpersonal problems, which are typically more complex. Students will also learn ways of improving their problem-solving skills with both types of problems.

Objectives

Students will

- list problems they need to be able to solve
- identify problem-solving strategies they already know
- distinguish problems from hardships
- distinguish scientific problems from those involving human relationships and those involving one's own feelings (inner problems)
- use a problem-solving strategy for solving scientific problems
- solve scientific problems as a group
- organize a group for solving problems effectively
- use brainstorming in solving a problem
- identify problems in human relationships
- solve a problem involving interpersonal relationships
- evaluate their own contributions to a group problem-solving activity
- recognize emotional reactions to the stresses of problem solving
- use emotional reactions to identify a problem which needs to be solved
- evaluate an author's use of emotional appeals to motivate people to solve a problem
- evaluate the role of emotions in motivating people to solve problems
- describe the role that literature has played in solving social problems
- describe the special problem-solving techniques that are needed to solve conflicts
- role-play a confrontation in which a conflict is addressed in words that will not automatically create anger
- define a conflict from both points of view
- describe a conflict from the point of view of one's opponent
- generate solutions for a conflict
- identify what kind of additional problem-solving skills they need to learn.

Lesson 1: **Identifying Problems**

ACTIVITY:

Recognizing Problems (page 51)

This activity can be assigned as homework the night before you begin the unit, or it can be done in class with you reading the instructions for each part of the activity.

After students have completed the written reflection, you might discuss some of the results with the class as an introduction to problem solving. Ask each student to contribute one problem to a list on the chalkboard of either personal or world problems. Ask students to react to both lists when they are completed. Encourage them to share some of their most successful problem-solving experiences.

ACTIVITY:

Distinguishing among Different Kinds of Problems (page 52)

Assign students to read the introduction and "The Use of Force" either in class or as homework. Then lead a class discussion on the story using the questions in the text or adapting them

to your own style. Following the discussion, students should be able to further categorize the personal and global problems listed in the preceding activity.

Distinguishing Problems from Hardships

Read or have students read this section.

ACTIVITY:

Analyzing Different Kinds of Problems (page 56)

Divide the class into groups of three or four and ask the groups to decide whether each problem should be dealt with as a medical or scientific problem, an interpersonal problem, or an inner problem (or as all three).

As the groups are working, circulate and see what results they are coming up with. Ask one group with fairly representative answers to give their answers and let the other groups share disagreements. The answers may vary. However, students should note the following: (1) The first problem may have a medical solution but also has interpersonal and inner aspects which may not be solved by the medical solution. (2) The second problem probably does not have a medical solution. (3) An individual cannot solve the scientific problems of nuclear war. However, he or she can deal with the inner problems and can work with others on the scientific and interpersonal solutions. (4) The person with a bad temper probably has an inner problem but perhaps should check to see if there are medical reasons for it.

Reflection (page 57): It would be best, if you have time, for students to do this exercise right after the group activity. This way, their feelings will be fresh in their minds. However, the exercise could be assigned as homework.

Lesson 2: **Solving Scientific Problems**

ACTIVITY:

A Strategy for Solving Scientific Problems (page 58)

Follow the steps in the text for a class discussion. The problem-solving steps listed in question 2 fit most problems (with some variations) and can be found in many analyses. Depending on the type of problem used, however, the description of the stages may vary. Often the problem is so obvious that a special step identifying the problem is not necessary. Step *b* is often stated as "Define the problem." Step *c* is sometimes stated as "Think of alternative solutions to the problem." Depending on the type of problem, it may be necessary to gather some data before this step, and it may be useful to make a single guess or to generate a range of alternatives before narrowing them down.

Gathering information may be an extremely important, very involved part of the process (as in a scientific experiment or a research problem), or it may be simply a matter of reviewing the information people already have (as in a personal problem).

Step *e* is the last step only if the hypothesis was correct. If not, one needs to go back to step *c* or even to step *b*.

ACTIVITY:

Solving a Scientific Problem (page 59)

If you have a videotape machine available, you might use it to record the problem-solving part of this activity. You could then replay the tape as students try to recall their process in question 2.

As students are trying to solve the problem, take notes on the steps they go through and on who suggests new approaches. As you help students try to recall their problem-solving process, use your notes to remind them of various contributions.

If students cannot answer the questions in the text about what they tried to do, ask them to try to recall who spoke first. Then ask what the first speaker was trying to accomplish. Continue this process. Do not try to list every contribution, just every type of contribution.

Group Problem-Solving Techniques

Lead the class through a recitation on this material. Ask students to compare their attempts to solve the previous problems with the suggestions given in the text.

ACTIVITY:

Trying Out Problem-Solving Techniques (page 61)

Choose one of the problems to assign your class. Use the same procedure as in the previous activity. However, this time the class should incorporate the group problem-solving techniques in their process. If the class did quite poorly on the previous activity, you might have them list on the board the things they will try to do differently. You may want to use this procedure to give a grade on the exercise.

Reflection (page 61): This exercise should be done immediately after the class activity. You could collect this reflection and give your own feedback to the student's individual performance during the group task. You could then grade the student individually on the group task.

Lesson 3: **Interpersonal Problems**

ACTIVITY:

Assembly Line Game (page 62)

As students do the game, they should discover that the tasks are not equally divided. Observe how they handle this problem. If groups ask you, tell them that members may help each other or redistribute the tasks. However, do not make the announcement to the whole class.

In the discussion following the game, some groups may complain that they weren't aware that members could help each other or modify the procedure. In this case, remind them of step 2 of the problem-solving model ("defining the problem," as explained on page 60).

Solving Interpersonal Problems

Have students read this section, or summarize it in a lecture.

ACTIVITY:

Solving an Interpersonal Problem (page 64)

Observe the groups as they work on this problem. At the end, give feedback to the class as a whole. Note any problems which several groups encountered, and compliment them on things most groups did well.

Reflection (page 65): This exercise should be done immediately after the activities, if possible.

Lesson 4: **The Role of the Emotions in Problem Solving**

Summarize or ask students to read the introduction to this lesson.

ACTIVITY:

Literature and Problem Solving (page 66)

Students can do this assignment either individually or as a full class. If they do the activity silently, they should discuss together the last set of questions.

Reflection (page 70): This exercise can be done at home or during class.

Going Beyond (page 70)

Students need not read the books listed to do this exercise. Instead, they may use literature reference works. In fact, this would be a good time to introduce such reference books (you can, of course, also assign specific books or poems in addition to reference works about the author's impact on society).

If the class has recently read works by any of the authors listed, you might prefer to discuss the author's role in identifying a problem with the whole class instead of having students research authors individually.

Reflection (page 70): Remind students of this assignment over the next few days. If they want to keep this section of the journal private, they can staple another piece of paper over it before you collect journals again.

Lesson 5: **Reason and Emotion in Problem Solving**

Summarize the ideas in the introduction to this lesson.

ACTIVITY:

Confronting the Problem (page 71)

Instead of waiting until all skits are finished to start your chart, you may prefer to list techniques after each skit. Use your judgment based on the class.

Defining a Problem from Both Points of View

Read or summarize this section for the class. You may want to give some additional examples, perhaps from literature that the class has studied recently.

ACTIVITY:

Defining Problems (page 73)

This assignment can be written by students individually, as noted, or it can be done in small groups or by the whole class.

Reflection (page 74): Note that students do not have to write the answers to the questions asked here. However, if your students are willing to talk about their feelings, you could discuss the questions in class.

Seeking Solutions

Read or summarize this section for your students. You might add more information about "win-win" solutions to conflicts. Chapter 4 in *Getting to Yes* (Roger Fisher and William Ury 1981) provides more ideas.

ACTIVITY:

Finding Solutions (page 75)

Observe the groups working on the conflicts presented. Either give them feedback on their problem-solving skills or lead a discussion asking them what parts they did well and what they could have done better.

Reflection (page 75): This is the last reflection in Unit 3. Therefore, now would be a good time to collect journals if you haven't been checking them periodically.

Resources for the Teacher

Fisher, Roger, and William Ury. *Getting to Yes.* Boston: Houghton-Mifflin Co., 1981.

Osborn, Alex. *Applied Imagination: Principles and*

Procedures of Creative Problem-Solving. New York: Charles Scribner's Sons, 1963.

Parnes, Sidney. *Creative Behavior Guidebook*. New York: Charles Scribner's Sons, 1967.

Stanford, Barbara. *Peacemaking: A Guide to Conflict Resolution for Individuals, Groups, and Nations*. New York: Bantam, 1976.

Stanford, Gene. *Developing Effective Classroom Groups*. New York: Hart, 1977.

UNIT IV: **The Creative Imagination**

In this unit, students explore the creative aspects of the thinking process, which, being less conscious, are often not taught. Students will read about the experience of creation from creative thinkers. They will also use activities based on recent research to try to stimulate their own creative powers.

Because this unit is based on quite recent research, some of the terminology, concepts, and exercises may seem unfamiliar. Actually, the exercises are more likely to be familiar than the theories, because activities for enhancing creativity were developed through trial and error long before any theories of creativity were available to help explain how they worked. During the past few decades, research on the physiology of the brain, biofeedback research, and studies of creativity have provided much more theoretical knowledge to guide our use of creativity exercises. However, researchers are still quite far from agreeing on a unified model of mental functioning.

The idea that there are two major modes of thinking has been widely recognized, particularly among people who have studied creativity. For example, Edward de Bono (1970) distinguishes "lateral thinking" from "vertical thinking." Lateral thinking is closely related to insight, creativity, and humor. This type of thinking, says de Bono, "involves restructuring, escape and the provocation of new patterns. . . . it is concerned with the generation of new ideas." Arthur Deikman (in Ornstein 1973) uses the labels "action mode" and "receptive mode" to describe states of thinking. The action mode is "the state of striving, oriented toward achieving personal goals . . ." The receptive mode is "a state organized around intake of the environment rather than manipulation. . . ." Other researchers have described the differing modes of thinking in such terms as "rational versus creative" or "logical versus intuitive." In addition, creative thinkers have long described two clearly different processes of thought.

As brain research has advanced, some evidence has been found of the relationships between physiology and mental functioning. For example, the relationship among mode of thinking, brain-wave patterns, and general level of body relaxation has been established by electroencephalogram research. However, there is still much to be learned about the relationship between brain-wave patterns and mental functioning. For example, the relationship between brain-wave patterns and the use of the two hemispheres of the brain has not been established. This is in spite of the many similarities between alpha and beta thinking and the tasks that seem to be performed by the right and left hemispheres of the brain.

For the purposes of this book, the authors have chosen to emphasize the alpha and beta theory because it is more useful for teaching. A person

can learn to consciously change his or her level of relaxation and type of brain waves. However, conscious choice of using right or left hemispheres of the brain does not at this point seem feasible.

Objectives

Students will

- identify alpha and beta states in their own thinking
- identify which type of thinking is needed for various types of tasks
- observe the functioning of their own minds
- improve their ability to concentrate on creative tasks
- recognize artificial aids to concentration
- learn healthy means of improving concentration
- concentrate on visual images by using the alpha state
- use alpha concentration to increase imagery in writing description and narration
- use a strategy for creative problem solving
- alternate between creative and critical modes of thinking
- understand thoughts imbedded in story imagery
- use fantasy writing to explore personal decisions
- recognize meaning and significance in cultural myths and images
- create personal myths.

English Skills

The creative thinking skills taught in this unit will be of greatest benefit in writing. Students will learn

- to promote "inspiration"
- to evaluate and improve their process of writing
- to stimulate creative imagery.

The concepts taught in this unit will also provide a framework for better understanding of literature. As a result of this unit, students will better understand

- why rhythm is important in poetry and speeches
- how to read to appreciate imagery and rhythm more effectively.

Suggestions for Teaching

Since this unit depends so heavily on experience and interpretation of experience, you will probably want to do ahead of time any exercises that you have not done before or that are unfamiliar to you.

The lessons in this unit are carefully sequenced. You should complete the activities in each lesson before going on to the next one. However, the lessons do not all have to be done in the same block of time. It may, in fact, be useful to alternate lessons in this unit with other types of lessons, such as grammar or literature. This method is particularly effective if you or your students find the activities in the unit difficult. Leaving some time between lessons allows time for the subconscious mind to process the new ideas and to begin to see the new concepts in everyday experience. If you do not have time to complete the whole unit, or if you or the class find it too difficult, stop at whatever level of difficulty is challenging but not impossible. Since the exercises increase in difficulty throughout the unit, it is not useful to try to force a class to do Lesson 5 if Lesson 4 is beyond their present ability.

Student (and teacher) reactions to this unit will vary widely. Many people, particularly those who have developed their creative skills on their own, will recognize the ideas and many of the activities of this unit. These persons will find the unit fun

and easy. Other people, particularly those who have generally succeeded in school because of their skills in the more traditional ways of thinking, are likely to find this unit quite frustrating. These persons may need to be reminded that it is important to improve in one's areas of weakness as well as in one's strong areas.

Lesson 1: **Recognizing Inspiration**

You will probably want to begin this unit by having students read the lesson introduction and discussing it, or by summarizing the ideas from the introduction and your own reasons for teaching creative thinking.

Alpha Waves and Beta Waves

ACTIVITY:

Learning to Recognize Alpha and Beta (page 79)

Note: The directions for most activities in this unit are written so that students can do them independently. However, many activities will be most successful if led by the teacher or by a student who may have had a lot of experience with this type of exercise.

Introduce the activity by telling students that they are going to experience two different kinds of thinking. Then give them the directions for the first part of the activity. Give students two or three minutes of silence to try to visualize the meal. Watch for nonverbal signs that they are thinking and that they are then losing concentration. When you notice about half of the class starting to fidget, tell them to go on to the next part. Wait until almost everyone finishes the exercise before telling students to begin working on their reflection journals.

Reflection (page 80): Before students begin writing, you may want to ask a few students to share orally the differences they were aware of. If the class has generally found the Reflection exercises difficult, you might have them answer all of the questions in this exercise orally before they begin writing.

ACTIVITY:

Identifying Two Types of Thinking (page 80)

Depending on the way you and your students work most effectively, you can either assign students to read "Creative Thought Processes of a Mathematician" silently, or you may read or have it read aloud. Because of the esoteric vocabulary in the selection, you may want to read this selection yourself.

If you read the selection aloud, ask students to raise their hands as they hear what sounds like a change in thought patterns. After they raise their hands, ask whether they think the new pattern is alpha or beta.

Students should identify as alpha (1) the part in the first paragraph at which "ideas rose in crowds," (2) the description of the sudden insight on the omnibus step in Coutances, and (3) the ideas which came on the walk in the third paragraph. In all three cases the ideas arose suddenly out of a state of relaxation. Do not, however, reject different answers. Ask students to explain answers and have them refer back to the descriptions of the two states and their own experiences.

Rephrase questions 2 and 3 in your own words and lead a class discussion over these two topics. In question 3, students should particularly note the relaxed circumstances and the fact that the insights were not what Poincaré had expected to discover. They were not results he would have ever achieved by working at his desk because he was asking the wrong questions and using the wrong procedures.

Reflection (page 82): Assign students to do this exercise as homework. You might ask students to share a few examples the next day to begin class.

Lesson 2: **Shifting Gears**

Ask students to read this section, or summarize the ideas from it yourself.

ACTIVITY:

Recalling the Shifts (page 83)

Although students are given directions so they can do this exercise themselves, you will probably want to lead it. Ask students to relax and then instruct them to recall a time when they shifted from alpha to beta thinking processes suddenly and consciously. After giving students a couple of minutes to think, ask them to either share the experience aloud or to write a paragraph describing it. Note that recalling a scene can usually be done more vividly in the alpha state, so giving the students silence and encouraging time to relax is likely to produce better results than pressing for immediate answers.

In the same way, have students take a minute or two to recall experiences of shifting from beta to alpha. Have several students share their experiences, then ask the other questions about trying to avoid the shift or keeping themselves in the beta state during class.

Developing Concentration

Read aloud or ask students to read aloud this paragraph.

ACTIVITY:

Thinking about Concentration (page 84)

Read aloud or have students read the two selections. Then use the questions as a guide to leading a discussion on the selections.

ACTIVITY:

Shifting to the Alpha State (page 87)

You will probably want to experiment with these techniques, and choose the one or two that you feel most comfortable with.

There are many similar exercises available for helping one enter the alpha state. Most techniques for relaxation and many meditation techniques are designed to help a person enter the alpha state.

Meditation is not discussed in the text because most meditation techniques are associated with particular religious beliefs. Also, many meditation techniques have strong effects on mental processes other than simply entering the alpha state and should be undertaken only with a reliable teacher. However, the following books contain some basic meditation and relaxation activities which can be used to shift to the alpha state and enhance perception by someone with no additional training:

Nhat Hanh, Thich. *The Miracle of Being Awake*. Nyack, New York: Fellowship Books, 1975.

Hendricks, Gay, and Wills, Russell. *The Centering Book: Awareness Activities for Children, Parents and Teachers*. Englewood Cliffs, New Jersey: Prentice-Hall, 1975.

A number of relaxation tapes are also available. Most of these use music, imagery, or a relaxation routine to induce the alpha state. Many people find tapes the easiest way to begin to recognize the state.

Reflection (page 88): You may want to check journal entries for this exercise or discuss with the class how successful they feel about getting into the alpha state. If most of the class is still having trouble identifying and getting into the alpha state, encourage the more successful students to share their experiences and techniques. You may also want to do some additional relaxation exercises before going on with the unit.

Lesson 3: Using the Creative Imagination in Writing

Ask students to read the introduction to this lesson.

ACTIVITY:

The Alpha State in Writing (page 91)

Before the class discussion of the two questions, you might have students make their own individual lists of the differing techniques between Elise Boulding's introspection on one hand and those of Arnold Palmer on the other.

Reflection (page 91): The assignment to write a paragraph might well be a homework assignment. Some students may be willing to share their perceptions with the class.

Imagery and Alpha Thinking

Ask students to read the introduction to this section.

ACTIVITY:

Recreating a Place and Writing a Description (page 92)

To lead the imaging exercise, ask students to sit comfortably and close their eyes. Read the directions slowly in a calm tone of voice. Participate in the exercise yourself, and pace your reading as you do the activity. For example, read the directions to relax the feet, then relax your own feet, then continue with the directions.

After you read "Relax and enjoy the place," pause for a few moments. Try to visualize, feel, and smell the place yourself, or observe students' nonverbal reactions. As long as students are sitting motionless, they are probably still involved in the activity. When about half of the class begins to fidget, give the final instructions to open their eyes.

Maintain a calm atmosphere and quietly give the directions to write the poem or the essay. Let students begin writing at their own pace. As they work, observe whether they alternate between writing and trying to return to the alpha state. You may decide to collect and grade the writing in the traditional way. Or you may want to collect the writing for this activity and the next at the same time, along with the Reflection exercise. (This way, you can give students evaluation and feedback not only on the product but the process as well.)

ACTIVITY:

Recreating Your Memories and Writing a Narrative (page 92)

Begin this activity with directions to students to relax and close their eyes. Read the directions for visualization very slowly. Follow the same pattern as for the previous activity.

Reflection (page 92): This exercise may be done during class or at home.

Lesson 4: Using the Creative Imagination in Problem Solving

The activities in this lesson were inspired by a sophisticated futures invention workshop developed by Warren Ziegler and Elise Boulding. Ziegler's *Mindbook of Exercises for Futures Inventors* (1982) provides more detailed analysis and exercises in creating and using images. Workshops on the approach are available through The Futures Invention Associates, 2026 Hudson St., Denver, Colorado 80207. Like most activities used to stimulate the creative faculty, this imaging technique is easier to learn in person than from a book.

Be sure to read through the activities and their directions ahead of time. You might practice reading the directions for the fantasy trip aloud and following them yourself.

ACTIVITY:

Problem Solving in the Beta State (page 93)

This writing assignment should probably be done in class, after the students have had twenty minutes to think. Recognizing that the topic is very broad, you should evaluate the essays on the basis of how well the writer followed the problem-solving techniques.

Reflection (page 94): This is another simple exercise in metacognition.

ACTIVITY:

Using the Alpha State to Explore a Problem (page 94)

Use your knowledge of your class to decide whether they will do this activity better in small groups of five or six people or with you leading the whole class. (Most classes will probably do better with you leading.)

After going through the alpha state exercise slowly, encourage students to share their images. If it seems helpful, ask questions that might help them recreate their images. For example, you might ask, "Can you tell us more what it looked like? Did you see any more details?" If all of the images sound similar, you might ask, "Did anyone see something different?" Do not allow any criticism and discourage any comments except perhaps "That's interesting." If students react adversely to any of their classmates' images, remind them that they are being asked to report what they saw, not what they want to be there. Therefore, they should respect honest reporting, even if they don't like what they hear. If students want to criticize the images, particularly to point out how unrealistic they are, say that they will have a chance to evaluate and criticize in the next step, but that now the focus is on simply hearing about the images.

The discussion should be low-key and non-threatening. Don't worry if there is a lot of silence, because people may need to keep returning to the alpha state to recall their images. If some students have trouble recalling images, let them pass. If *most* students seem to have trouble recalling images, have them write down their images first before sharing them.

After discussing images, go on to the evaluation part of the activity.

If students have tried to criticize the images before, go back to the students with the criticisms and let them start the discussion. If students are hesitant to be critical, you might play devil's advocate.

Group Reflection (page 96): This exercise is rather complex, and students are likely to have questions and reactions. It is very important to reassure students who were not successful in following the activity all the way through that their reactions were normal. It is particularly common for a person to get "stuck" in a particular image on the fantasy trip and be unable to continue.

See if students can identify the following purposes of the various parts of the activity.

1. The relaxation part of the exercise was designed to induce the alpha state.
2. The "space trip" was designed to free the mind from preconceptions. The device of expanding the field of awareness in space is particularly useful.
3. The imaging itself was designed to create new ideas.
4. The discussion was designed to capture the ideas.
5. The evaluation was designed to critique ideas.

This activity can be varied for a wide range of problems and issues. In fact, if the arms race is not an issue of concern to your students, you can adapt the lesson to deal with any other projected future change which does interest them.

Lesson 5: **Exploring Meaning and Values**

Summarize or ask students to read the introduction to this lesson.

ACTIVITY:

Thinking in Stories (page 98)

Assign students to work in pairs on this activity. Reconvene the class to discuss the questions.

ACTIVITY:

Exploring Values by Writing Stories (page 99)

Lead the fantasy activity in the first paragraph in the same way you led the visualization activities earlier. Use whatever relaxation technique works best to help students get into the alpha state. Allow students plenty of time to fantasize before directing them to begin writing.

Since this activity is personal, you may want to simply give credit for doing the assignment instead of reading and grading the papers. Certainly if students resist turning in papers because they are too personal, you should respect their privacy.

The Larger Story

Summarize or have students read the introduction to this section.

ACTIVITY:

Examining Myths and Images (page 101)

Either find a recording of the "I Have a Dream" speech, prepare to read it aloud yourself, or assign a student with dramatic talent to read it aloud. If you have no students with the right talent, you might check with the speech teacher to see if there is a speech or drama student who would be willing to do it as a special project.

After the speech, use the questions as the basis for a class discussion.

ACTIVITY:

Seeing the Meaning of Our Lives (page 103)

Use a procedure similar to the previous activity's with Lincoln's Gettysburg Address.

ACTIVITY:

Creating Your Own Myth (page 104)

You will need to define the length of this personal narrative, depending in some measure on whether you wish to grade the story as a major element in the unit.

Reflection (page 104): Some students may be willing to share their introspection about thinking skills with the entire class.

Resources for the Teacher

Bettelheim, Bruno. *The Uses of Enchantment: The Meaning and Importance of Fairy Tales.* New York: Vintage, 1977.

Bloomfield, Harold H. *TM: Discovering Inner Energy and Overcoming Stress.* New York: Delacorte Press, 1975.

Campbell, Joseph. *Myths to Live By.* New York: Viking, 1972.

de Bono, Edward. *Lateral Thinking: Creativity Step by Step.* New York: Harper & Row, 1970.

Deikman, Arthur J. "Bimodal Consciousness." In Ornstein, Robert E., ed., *The Nature of Human Consciousness.* San Francisco: Freeman, 1973.

Lévi-Strauss, Claude. *The Raw and the Cooked.* New York: Harper & Row, 1969.

Maslow, Abraham. *Toward a Psychology of Being.* 2d ed. New York: Van Nostrand Reinhold, 1968.

Petrel-Petrelevicius, Edward. *New Explorations in Mind Learning*. Philadelphia: Dorrance, 1975.

Richards, Mary C. *Toward Wholeness: Rudolph Steiner Education in America*. Middletown, Conn.: Wesleyan University Press, 1980.

Silko, L. M. *Ceremony*. New York: Viking, 1977.

Vygotsky, Lev Semenovich. *Mind in Society: The Development of Higher Psychological Processes*. Eds. Michael Cole, et. al. Cambridge: Harvard University Press, 1978.

Winn, Denise. *The Manipulated Mind*. London: The Octagon Press, 1983.

Ziegler, Warren. *A Mindbook of Exercises for Futures-Inventors including Exercises in Imaging, Intentioning and Action-Planning*. Denver: The Futures Invention Associates, 1982.

———. *A Mindbook for Imaging a World Without Weapons*. Denver: The Futures Invention Associates.

Bibliography

Capra, Fritjof. *The Turning Point*. New York: Simon & Schuster, 1982.

Emig, Janet. *The Composing Processes of Twelfth Graders*. Urbana, Ill.: National Council of Teachers of English, 1971.

Ferguson, Marilyn. *The Aquarian Conspiracy*. Los Angeles: J. P. Tarcher, Inc., 1980.

Fuller, R. Buckminster. *Critical Path*. New York: St. Martin's Press, 1981.

Gilligan, Carol. *In a Different Voice: Psychological Theory and Women's Development*. Cambridge: Harvard University Press, 1982.

Gray, Elizabeth Dodson. *Green Paradise Lost*. Wellesley, Mass.: Roundtable Press, 1979.

Lessing, Doris. *Canopus in Argos: Archives*. New York: Vintage, 1983.

Maslow, Abraham. "Creativity in Self-actualizing People." In *Psychology of Education*, ed. G. Davis and T. Warren. Lexington, Mass.: D.C. Heath, 1974.

Ornstein, Robert E. *The Psychology of Consciousness*. San Francisco: Freeman, 1972.

Piaget, Jean. *The Psychology of Intelligence*. 1950. Reprint. Boston: Routledge & Kegan Paul, 1971.

Shah, Idries, *Learning How to Learn*. London: The Octagon Press, 1978.